



Nutrition is critical for the in-foal broodmare to deliver a healthy foal

OVER THE PAST THREE DECADES we've learned more about fine-tuning nutrition for pregnant mares. Dr. Stephen Duren, PhD (equine nutritionist, Performance Horse Nutrition) says conscientious Thoroughbred breeders have always tried to optimize health and development of the unborn foal, but the industry has become more diligent in recent years. This is partly due to concern about breakdowns at the track, to determine whether we can do more to prepare young horses nutritionally for this strenuous career.

"Are they getting proper nutrition, starting from conception? The equine industry updated its nutrient requirements for horses in 2007 and made significant advances in gathering established literature and putting it together—modifying the earlier recommendations," Duren said.

INDIVIDUAL DIFFERENCES

Dr. Kathleen Crandell, PhD, an equine nutritionist for Kentucky Equine Research in Versailles Ky., says nutrient requirements at the time of breeding for each individual broodmare can be different, depending on whether they are still lactating or just barren or maiden mares.

"Research indicates that mares gaining weight have better conception rates, and that mares losing weight have poorer conception rates," she said. "With a lactating mare there's a chance she will be losing weight as she puts so much nutrition into producing milk. This may have an effect on her ability to conceive or maintain a pregnancy. Thus, it is important to supply adequate protein and calories so the mare can maintain weight.

"By contrast, with the barren mare or maiden mare there's not always a lot of thought regard-

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HEALTHZONE

Nutrition

ing nutrition, especially in early pregnancy, but having the right balance of nutrients in the diet is equally important for them for everything to work correctly in fetal development,” she continued. “We don’t want those mares deficient or losing weight, and we don’t want them too fat. We want them in a body condition score between 5 and 6 on the Henneke body condition scoring scale. If they are easy keepers, they may just need a vitamin-mineral supplement.

“Often those needs can be met with a mineralized salt when mares are out on pasture, but you can’t control intake that way—particularly in a group of mares,” Crandell said. “If they can be fed individually, using a ration-balancer pellet, this is a good way to supply them with the vitamins and minerals as well as supplemental protein since they don’t need the extra calories of a typical concentrate.

“If a mare is a hard-keeper, needing more calories, a concentrate can be fed. At this early stage of pregnancy, it doesn’t necessarily need to be one that’s formulated specifically for brood-



COURTESY DR. KATHLEEN CRANDELL

Kentucky Equine Research’s Dr. Kathleen Crandell



**He’s been writing a
story for thirty years.**

mares, but you do need to pay attention to feeding rate. If a mare is getting less than the minimum recommended feeding rate, she won't be getting the proper amount of vitamins and minerals, and you'd need to top it off with a ration balancer supplement," she said.

Mares due to foal in January, February, and March in cold climates have higher energy requirements just to maintain body weight during lower winter temperatures.

"You don't want them losing weight, so you should monitor them and make sure you are meeting those energy requirements for colder temperatures so they will be able to conceive when rebred," Crandell said.

Feeding schedules can affect reproductive success.

"This was seen in a study that fed mares either all their forage in one feeding at night or divided into two feedings.

Though both groups were receiving the same amount of forage over a 24-hour period, the mares fed twice a day had significantly fewer estrous cycle abnormalities and significantly higher conception rates.

"Omega-3 fatty acid supplementation in the forms of EPA and DHA have shown promising help for broodmares at breeding," she said. "In a recent study, mares supplemented with a marine-derived Omega-3 supplement had better uterine health than unsupplemented cohorts. Another study found higher levels of progesterone, faster involution of the non-pregnant horn after foaling, and reduced post-breeding inflammatory response."

STAGE OF PREGNANCY

"The nutrient requirements now listed for pregnant mares have changed a bit since those published in 1989," said Duren. "We used to think of mares as having two stages of pregnancy—early



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Proper feeding of the broodmare can influence the health of the foal

gestation and late gestation. The newer guidelines break it down further. We now look at whether the mare is less than five months pregnant and call this early pregnancy. After that, pregnancy is broken down month by month until foaling. Guidelines have been modified and the requirements fine-tuned for optimum nutrition, making adjustments as necessary, so these mares will get everything that they need," he explained.

"The nutrient requirements for pregnant mares are well defined, broken down into month of pregnancy. In my opinion those guidelines are accurate and you know exactly how many milligrams of copper, zinc, etc. are needed. You can see the gradual increases required in caloric intake, protein, calcium, phosphorus, and micronutrients. I often calculate diets for clients, and it should change as the mare gets further along in the pregnancy.

"Many people are still under the impression, however, that feeding a pregnant mare to address the needs of the fetus is only important in the last trimester," he said. "It is important at that time, but also important from the beginning. I feed Thoroughbred mares from conception through foaling as pregnant mares. Many of these mares don't have high nutrient requirements early in pregnancy

unless they are lactating but do have certain requirements for trace minerals and vitamins that are important to the early growth and development of the fetus."

Many organs, including the heart, and various body systems such as the neurologic system are formed very early.

During pregnancy a mare's nutrient requirements gradually increase.

"In the first trimester you are just trying to make sure mares maintain proper body weight, without gaining too much weight," Crandell said. "They don't need much extra feed at first but do need proper nutrient balance. It was customary in years past for breeders to turn mares out to pasture after they were bred and not look at them again until the last trimester. This is no longer considered ideal. Even though these mares might get enough protein and calories from the pasture, they might be missing some of the other essential nutrients, particularly some of the trace minerals.

"During the first and second trimester they may need supplementation to supply the missing nutrients," she continued. "This can be done by feeding a concentrate designed for pregnant mares or just a ration-balancer if you are trying to keep a mare from gaining too much weight. Most feed companies have a product designed for broodmares.

"We re-evaluate her body condition as she goes into the last trimester (the final 110 days of pregnancy)," Duren said. "This is when the bulk of fetal growth occurs. It goes from less than 20% of birth weight to birth weight in that short time. This involves rapid assimilation of tissue, which drives the mare's nutrient requirement up. At that phase of pregnancy, most mares are switched from the balancer pellets to a commercial grain concentrate designed for mares in late pregnancy.

"The exception to that guideline is a mare that's overweight or obese," he said. "In that case you'd continue to feed the balancer pellets (and no grain) up until foaling."

Crandell noted it gets more complicated during the last trimester since the growth of the foal is exponential.

"There is hardly any weight gain in a mare from the foal in early pregnancy; it's mostly an increase in placental tissues until about the seventh month of gestation—and then the fetus grows swiftly," she said. "Some nutrients like calcium and phosphorus are important for fetal bone development, along with zinc, copper, manganese, selenium, etc. which need to be supplemented in adequate amounts. If the mare doesn't have enough in her diet, she will rob these essential nutrients from her own body to supply the needs of the fetus. The last thing you want is for her to become deficient at this time, shortly before lactation."

In the last trimester the fetus is accumulating stores of trace minerals in its liver.

"This gives the foal an adequate supply for a while after it is born since these minerals are not transferred very well from the mare in the milk," she said. "Thus, it is important for the pregnant mare to have adequate supply of these minerals in her diet so she won't deplete her own body while the fetus is developing and storing minerals in its liver."

In late gestation some mares experience weight loss, and often this can be prevented by an increase in the amount of concentrate.

"A study looking at maintaining late

gestational mares on a forage-only diet of either timothy or alfalfa hay found the mares were unable to maintain their weight on timothy hay alone," she explained. "Timothy hay was not energy-dense enough to support the fetal growth/weight gain and the maintenance needs of the mare.

"Providing a more calorie-dense forage such as alfalfa helps," she said. "In the last month of gestation, a mare may not be able to eat more volume of hay because the bulk of the fetus/placenta in the abdomen takes up more space and restricts capacity of the digestive tract. The mare can't take in as much feed, so to keep her from losing weight, a more calorie-dense feed may be needed. Providing additional fat (such as vegetable oil) can significantly boost the calories without adding bulk.

"However, don't forget the importance of forage in the diet. You can increase calories by providing a more energy-dense forage such as alfalfa or a high-quality alfalfa-grass mix instead of a bulkier, lower-calorie hay like timothy," she said.

"If the mare has been maintaining well on grass hay during early pregnancy and mid-pregnancy, you can add some alfalfa during the last trimester to boost calories and nutrients without having to feed her so much concentrate."

If you have a mare that typically loses a lot of weight when lactating, you could feed her up to a heavier weight before she foals, just to be ahead of the curve.

"The reason I evaluate the condition of a mare at the beginning of the third trimester is because we still have an opportunity at that time to put extra condition on the mare; she still has enough appetite to eat more," Duren said. "If we wait until a month before foaling to make big feeding changes because we just realized the mare is thin, she may not be able to consume the volume of feed necessary to gain weight. You want to start feeding her extra before she gets to this point in her pregnancy."

INSULIN ISSUES

"As calorie count in the diet increases, there's concern whether it will have

an effect on the mare's ability to handle increases in insulin without being detrimental to the mare or her foal," said Crandell. "While all mares become a little bit insulin-resistant during pregnancy as a natural way to boost glucose delivery to the fetus, there was a study done in Thoroughbreds looking at development of insulin resistance during pregnancy—to measure how much of an influence it had on insulin resistance in the foal. In this study there was no detriment (on insulin handling in newborn foals), but if there is a genetic factor that makes an individual horse more prone to insulin resistance (outside of pregnancy), that foal (offspring) may have problems as it matures."

Along those lines, issues can arise with mares that have insulin resistance problems.

"Some of these mares fail to enter seasonal anestrus or have prolonged periods between heat cycles, and a decline in age-related fertility," Crandell said. "It is important to maintain mares with questionable insulin-handling issues at appropriate body weight and not let them become obese.

"A recent study looking at the effects of obesity in mares on insulin-handling in

their foals found that while these mares had heavier foals than non-obese mares, there was no correlation with hyperinsulinemia in the foals. The foals were found to have more difficulty nursing, however, because of the fat deposits around the teats, and the mares had decreased milk production."

Another study showed IgG (Immunoglobulin G) concentrations in colostrum were lower in obese mares. Obesity in the mare can affect the fetus by predisposing the foal to developmental orthopedic disease after birth.

"Furthermore, heavier foals require vigilant monitoring because of the adverse effects on weight-bearing bone development," said Crandell.

Due to improvements in health of older horses, more mares are being bred at later ages.

"Age is another factor that can affect reproductive ability of the mare," she said. "Vitamin E has been found to support improved fertility in older mares that have trouble conceiving. Older mares can produce healthy, sound foals, but caution should be taken when breeding a mare that has Cushings (PPID) because of adverse effects of pergolide treatments on milk production. PPID horses and those

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FESCUE PROBLEMS

If mares are on pasture or being fed grass hay, fescue can be a concern when they are pregnant—especially during later stages of gestation. The fescue itself is not a problem, but the endophyte fungus often found in fescue produces a toxin that can cause agalactia (no milk) in the mare and an over-large fetus that goes beyond due date (prolonged gestation). This may cause dystocia, if the foal is too large, and sometimes a thickened placenta.

“It’s a very hardy grass and very common in horse pastures,” said Dr. Kathleen Crandell, PhD, an equine nutritionist for Kentucky Equine Research in Versailles Ky. “It stays green longer into the fall and winter than many other grasses, especially if it is endophyte-infected because that’s what makes it hardy. It may be still green in January and it tastes better (sweeter) after it’s been frozen, so horses like it in the winter better than they do during the summer.

“Getting pregnant mares off fescue pasture or hay at least 90 days before foaling is important,” she continued. “You don’t want to take any chances. Fescue may also be lurking in a mixed hay, and you may not realize it contains fescue, so it’s important to check. Make sure you are feeding something like orchardgrass, timothy, or mixed hay that does not contain fescue. Fescue has a wide blade when it is green and growing, but when it dries as hay, the leaf blades ball up and look more wiry. Once you know what it looks like, it is easy to recognize.”

By Heather Smith Thomas

order to create high-quality colostrum that contains adequate antibodies.”

TRACE MINERALS

“Research at Cornell University showed that mares receiving inadequate selenium in their diets were much more prone to reproductive problems than mares with adequate selenium. Another study, comparing higher versus lower levels of selenium supplementation in late gestational and lactating mares found higher serum IgG in the foals from the mares with higher level of supplementation up through eight weeks of age, according to Crandell.


A study looking at copper supplementation in New Zealand where the forages are notorious for being low in copper found mares supplemented with copper had foals with lower incidence of physitis and osteochondrosis dissecans (OCD) at six months of age than mares not receiving supplemental copper, regardless of whether the foals received supplemental copper themselves.

“It didn’t matter what the foals were fed,” Crandell said. “The effects were due to what the mares were fed during gestation.”

In another study, serum copper levels in supplemented mares were positively correlated with copper in the colostrum and serum copper levels in the foals.

“To me, this is an indication of how important it is to feed the mare properly during pregnancy,” Crandell said. “You can influence the health of the foal, beyond birth, by making sure the mare has proper nutrients in her diet.”

Feed manufacturers have made this easy, with feeds designed for broodmares. These ensure the proper balance of nutrients such as enough copper—as long as the concentrates are fed within the recommended feeding rates in the diet.

“Also, make sure broodmares have salt and plenty of fresh water,” she said. “These are important aspects of diet and nutrition as well.” 

Heather Smith Thomas is a freelance writer based in Idaho.

diagnosed with insulin resistance before pregnancy will benefit from feeding a diet based on fiber as the major energy source, avoiding starch and adding fat to the diet if there is a problem with maintaining weight (such as in late gestation and lactation).”

IMPORTANCE OF PROTEIN

Protein is needed to build body tissues.

“The mare needs adequate protein to supply the building blocks for fetal growth and development of the placenta and amniotic tissues; otherwise, she will break down her own muscle tissue to give protein to that foal,” explained Crandell. “To a certain extent, the foal will always have enough, even if the mare robs from her own body. This is why mildly protein-deficient mares don’t give birth to smaller foals, but you put those mares at a big disadvantage for lactation and recovery from pregnancy (before she can be rebred). There is no need for excessive protein, but make sure she has adequate protein.”

Any excess protein will simply be broken down and excreted in urine.

“Horses on pasture usually have ad-

equated protein, especially if you are adding a balancer or a concentrate,” Crandell continued. “If the mare is on a hay diet, however, more attention needs to be paid to protein content of the hay. Some grass hays are fairly low in protein, so you could add some alfalfa and/or a concentrate and ration balancer to boost protein.”

To produce milk, the lactating mare needs double the amount of protein than the early gestational mare.

“If dietary protein is restricted, it will result in a decrease in milk production and consequential decrease in foal growth,” said Crandell.

There have also been some studies to see whether quality of diet could influence the quality of colostrum.

“Those studies looked at nutrients such as vitamin E, omega 3 fatty acids, and bioactive proteins (in serum),” she said. “There was some indication that if a mare is receiving a diet high in omega 3 fatty acids (in the form of DHA), it will improve the IgG concentration in the colostrum.

“Bioactive protein supplementation also resulted in higher IgG levels in the mares. Late gestation mares need adequate nutrients and the proper amount of protein in