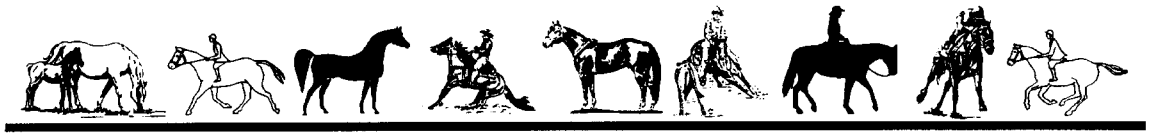
TEXAS A&M UNIVERSITY
DEPARTMENT OF ANIMAL SCIENCE
EQUINE SCIENCES PROGRAM



Nutritional Management of Pregnant and Lactating Mares

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Serious horse producers are concerned about their mares' reproductive performance and ability to mother strong, healthy foals. Economic survival often hinges on mares foaling early in the year, rebreeding quickly and nursing a growing foal that develops soundly. While achieving these goals in a herd of brood mares is dependent upon many factors, nutritional well-being is one important part of an effective brood mare operation.

Brood mares have specific nutritional requirements that differ from other classes of horses. There are differences both in the amount of feed mares need and in the nutrient concentration needed in that feed. Therefore, the brood mare fits into a class of her own.

Body Condition Affects Reproductive Performance

The observant mare owner is accustomed to monitoring body condition on a regular basis. Until recently, however, there were varying opinions as to the body condition most desirable for pregnant and milking mares.

Research results now offer valuable management information relative to the effect of nutrition on reproductive performance in mares. It has been clearly shown that mares should be kept in top condition the year round, and especially as breeding season approaches. By checking the apparent fat cover in mares at the areas shown in **Figure 1**, owners can assign a

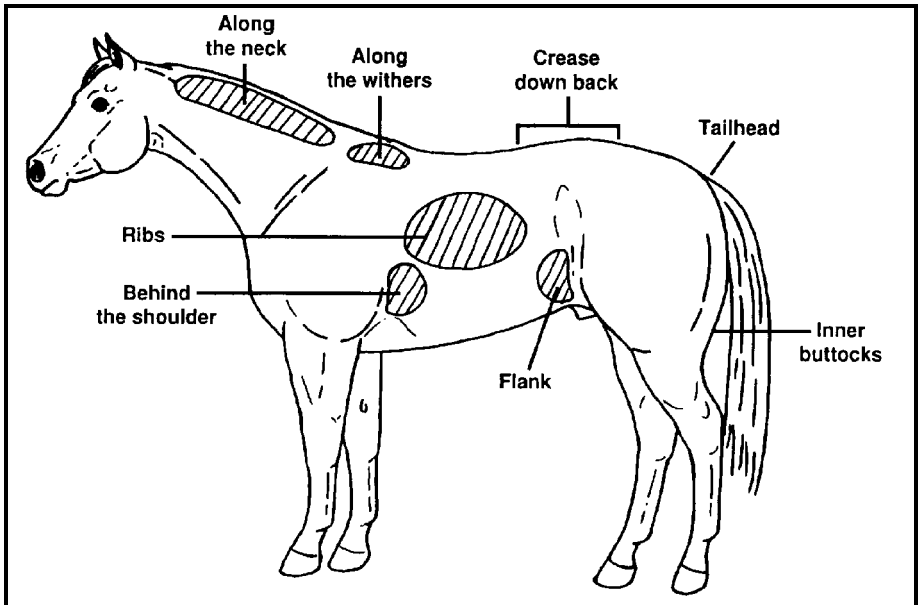


Figure 1. Areas emphasized in the condition score.

The Condition Score System

Score	Description
1	**Poor.** The horse is emaciated. The spinous processes (backbone), ribs, tailhead and hooks and pins all project prominently. The bone structures of the withers, shoulders and neck are easily noticeable, and no fat can be felt anywhere.
2	**Very Thin.** The spinous processes are prominent. The ribs, tailhead and pelvic bones stand out, and bone structures of the withers, neck and shoulders are faintly discernable.
3	**Thin.** The spinous processes stand out, but fat covers them to midpoint. Very slight fat cover can be felt over the ribs, but the spinous processes and ribs are easily discernable. The tailhead is prominent, but individual vertebrae cannot be seen. Hook bones are visible but appear rounded. Pin bones cannot be seen. The withers, shoulders and neck are accentuated.
4	**Moderately Thin.** The horse has a negative crease along its back and the outline of the ribs can just be seen. Fat can be felt around the tailhead. The hook bones cannot be seen and the withers, neck and shoulders do not look obviously thin.
5	**Moderate.** The back is level. Ribs cannot be seen but can be easily felt. Fat around the tailhead feels slightly spongy. The withers look rounded and the shoulder and neck blend smoothly into the body.
6	**Moderate to Fleshy.** There may be a slight crease down the back. Fat around the tailhead feels soft and fat over the ribs feels spongy. There are small deposits along the sides of the withers, behind the shoulders and along the sides of the neck.
7	**Fleshy.** There may be a crease down the back. Individual ribs can be felt, but there is noticeable fat between the ribs. Fat around the tailhead is soft. Fat is noticeable in the withers, the neck and behind the shoulders.
8	**Fat.** The horse has a crease down the back. Spaces between ribs are so filled with fat that the ribs are difficult to feel. The area along the withers is filled with fat, and fat around the tailhead feels very soft. The space behind the shoulders is filled in flush and some fat is deposited along the inner buttocks.
9	**Extremely Fat.** The crease down the back is very obvious. Fat appears in patches over the ribs and there is bulging fat around the tailhead, withers, shoulders and neck. Fat along the inner buttocks may cause buttocks to rub together, and the flank is filled in flush.

numerical condition score to mares.

Horsemen should use this scoring system as a basic management tool for determining whether or not mares are in optimum condition for breeding.

Research has demonstrated that mares with condition scores of less than 5 do not perform as well reproductively as do mares with scores greater than 5.

Moderately fleshy to fat mares can be expected to a) cycle earlier in the year, b) have fewer cycles per conception, c) have a higher pregnancy rate and d) maintain pregnancy more easily than thin mares.

Research also indicates that a condition score of 5 or less in milking mares means they do not have enough stored fat to support efficient reproductive performance. Those mares in marginal or poor body condition (5 or less) are more likely to skip a breeding season, and their bodies use dietary nutrients primarily for milk production rather than reproduction. When mares receive inadequate nutrition the incidence of embryo loss also increases. So, it is important to get mares in suitable body condition and keep them that way year round.

Reproductive performance often can be

improved in thin mares when they are fed to gain weight. However, putting weight on an extremely thin mare is costly, and can be dangerous as well because some digestive disorders are associated with high levels of feed intake. While no foaling difficulties or rebreeding problems have been found in mares that are obese, there are no reproductive advantages to keeping mares in a condition of 8 or 9. This can also be economically prohibitive. Therefore, scores of 5.5 to 7.5 represent the economic optimum, because mares in this condition normally spend fewer days at the breeding farm and less time open. Management of body condition should be supported by careful selection of feedstuffs and accurate ration formulation, because this is an important step in promoting normal foal growth.

The Importance of Roughage

Brood mares normally require good quality, long-stem roughage as part of the daily diet. Whether it is provided in the form of high quality grazing or as hay, this is usually the starting point for the development of an effective brood mare feeding program. Roughage plays an important role in minimizing digestive problems such as colic or founder, and discourages undesirable vices such as cribbing and tail chewing. Good roughage serves as a major source of nutrients for the mare.

Some types of grazing and hay can be potential health hazards for brood mares. Certain hybrid sorghum/sudan grasses have been reported to cause Cystitis Syndrome or Prussic Acid Poisoning, which can cause death. Pregrazing growth of these forages must be monitored and horses must be removed from grazing for several days when weather changes occur. Therefore, alternative roughage sources should be available if at all possible.

Horsemen who feed alfalfa hay as roughage should beware of the potential for blister beetle poisoning. Blister beetles contain the compound cantharidin, which is extremely toxic to all horses. Alfalfa from early, first cuttings is less likely to contain beetles than hay put up in the mid-summer months. Hay that is not crimped or conditioned may be less likely to contain blister beetles, but there are no guarantees. Horsemen should take time to visit with hay producers, consider the harvest date and method of cutting, and check alfalfa hay regularly for the presence of blister beetles.

Fescue can be a good roughage for horses in general, but it is harmful to mares if it contains endophyte fungus. Problems such as the total absence of milk production (agalactia) and early foal death have been associated with fescue fungus. Fescue can be tested to determine whether or not it contains fungus, and endophyte-free seed is available for reseeding. To be on the safe side, pregnant mares should be removed from questionable fescue at least 90 days prior to foaling.

Hay selected on the basis of 1) leafiness, 2) cleanliness, 3) aroma and 4) color will provide a safe and effective foundation for the brood mare feeding program. A high leaf:stem ratio, combined with cleanliness and a fresh smell, indicate quality from a nutrient standpoint. Hay that contains foreign material and is excessively weedy should be avoided, as should hay that looks or smells even the least bit moldy.

If round bales are used, care must be taken to maintain hay quality. It is often necessary to remove the weathered outer layer of a round bale, allowing mares to reach the high quality hay farther inside. There can be considerable wastage as mares forage from large round bales in the pasture or dry lot.

Mares kept in stalls or dry lots should receive at least 1 percent of their body weight in long roughage daily (1 pound hay/100 pounds body weight). Hay cubes can be fed as a roughage source, although some long-stem roughage may sometimes be needed to minimize possible problems such as wood chewing. Mares with access to top quality grazing will often consume more roughage than 1 percent of their body weight daily. Once the mares' roughage requirements are met, then supplemental energy, protein, minerals and vitamins can be provided in a concentrate mix to meet the remainder of their nutrient requirements.

Concentrate Feeds

Horsemen have some flexibility in terms of choosing feedstuffs for a horse ration.

Commercially prepared feeds are practical for feeding a small number of horses. Many of these feeds from reputable companies are balanced for protein, calcium and phosphorus, contain trace mineralized salt and are fortified with vitamins. Horse owners should not hesitate to consult the feed company for additional information that may not be listed on the feed tag. Owners with a large number of brood mares may find it more economical and practical to have a store or company custom mix a ration that can be delivered in bulk loads. Those owners choosing to mix rations on the farm should take time to balance for protein, minerals and vitamins. If individual grains are purchased for mixing, only the highest quality should be used. Inferior corn grain, for example, can contain the mycotoxin Fusarium moniliforme, which causes leucoencephalomalacia or moldy corn poisoning in horses. Horse owners should not use grain feeds that contain corn by-products and should not feed corn screenings to horses.

Recent interest has developed in feeding fat to brood mares, and research has shown that feed grade rendered fat can be utilized by mares to good advantage. Some commercial companies also add fat to feed concentrates. These fat-added feeds have varying energy densities and their daily feeding recommendations are normally listed on the tag or sack. Some of these feeds contain stabilized forms of fat, which allows them to be stored for longer periods of time. Fat-added diets are discussed further in the sections on late pregnancy and lactation.

There has been little research on the use of complete feeds, or those designed to be the only source of both concentrate and roughage. These feeds are normally very high in fiber and, therefore, contain less digestible energy than other concentrates. In some cases, the way in which these high fiber feeds are processed causes mares to consume them more slowly, thus making it possible to feed mares on a free choice basis. Consequently, some complete feeds may be practical, depending on the overall management system being used and the facilities available for feeding brood mares.

Cattle feeds sometimes can be utilized to good benefit. Some companies sell 10 percent and 14 percent crude protein cattle feeds and all-natural range feeds, often at a lower price than horse feeds. Contrary to popular opinion, horses can tolerate about the same level of urea in the diet as can cattle. However, urea is not useful other than in helping meet maintenance requirements, and is best left out of mare diets. Mare owners should make sure that any cattle feeds fed to horses contain absolutely no mold or additives such as rumensin or bovatec.

Total Feed Intake

The expected feed consumption by mares in various stages of pregnancy and lactation is shown in Table 1. Total daily feed intake by mares (hay + concentrate) normally ranges from 1.5 percent to 3.0 percent of body weight, with 2 percent serving as an average.

Daily feed intake depends on the type of hay or grazing available and varies according to the crude fiber level and energy density of the concentrate. Furthermore, mares are somewhat individualistic and daily feed intake often varies from horse to horse. Feed intake may have to be increased for hard keepers or heavy milkers, and decreased for other mares in the herd who are easier keepers.

Table 1. Expected feed consumption by mares (percent body weight).

Mare Status	Forage	Concentrate	Total
Early pregnancy	1.5-2.0	0-0.5	1.5-2.0
Late pregnancy	1.0-1.5	0.5-1.0	1.5-2.0
Early lactation	1.0-2.0	1.0-2.0	2.0-3.0
Late lactation	1.0-2.0	0.5-1.5	2.0-2.5

Early and Mid-gestation

A bred mare that is dry (not nursing a foal) and in the first 8 months of gestation has nutrient requirements very similar to those of any other mature, idle horse (Table 2). The unborn foal grows very slowly during this time (.2 pound/day) and it is usually considered sufficient simply to meet the mare's nutrient

Table 2. Daily nutrient requirements (1,100-pound mare).

Nutrients required	Early to mid-gestation	Late gestation	Lactating mare
Crude protein (pounds)	1.4	1.7	3.0
Digestible energy (megacalories)	16	18	28
Calcium (grams)	20	35	56
Phosphorus (grams)	14	26	36
Vitamin A (1,000 IU's)	15	30	30

requirements for maintenance.

Brood mare owners may want to take advantage of available grassland grazing to maintain mares during this early to mid-gestation time. Horses allowed free choice grazing will consume as much as 3 percent of their body weight in long roughage daily, which normally meets their needs for protein, energy, calcium and phosphorus. Poor quality pasture will not be adequate, however, and will lower the body condition of mares.

High quality hays, either grass or legume, are also excellent for maintaining dry, pregnant mares in the first stages of pregnancy. As an average, most mares will require from 1.5 to 1.75 percent of their body weight in high quality roughage daily to satisfy nutrient requirements.

Whether on good pasture or hay or both, dry mares in early pregnancy need only to be provided good water and access to a mineralized salt block or mix. Grazing and/or hay will usually maintain a mare that is already in acceptable body condition, but often will not put sufficient weight on mares that are in marginal condition.

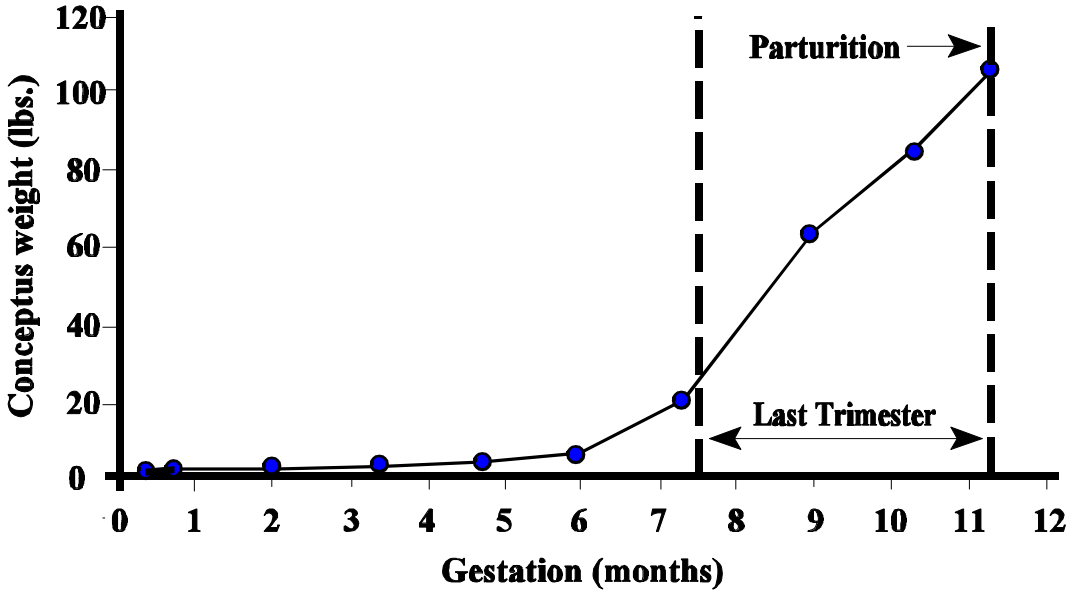
When high quality hay or grazing is not available in adequate amounts (as well as when weather is inclement), mares will need supplemental feed to maintain body weight and condition. Individual mares respond differently, but in most cases a concentrate with at least 10 percent crude protein fed at .5 to .75 percent of body weight daily will keep mares in good shape.

Late Pregnancy

As a mare enters the last few months of pregnancy, nutrient requirements increase because the unborn foal is growing more rapidly, averaging 1 pound/day (Figure 2). During this time, a mare in good condition will not require more total feed daily, but the concentration of protein, energy, calcium, phosphorus and Vitamin A in the feed must increase (Table 2). Nutrient balance is of major importance, since most fetal growth occurs during the last 4 months of gestation. It is during the tenth month that the largest amount of mineral retention occurs in the unborn foal.
Therefore, adequate nutrition of the mare is critical for normal fetal development.

In late gestation the mare should receive about 1.5 to 2.0 percent of her body weight in total feed daily. If top quality (minimum 18 percent crude protein) alfalfa hay or legume grazing is the source of roughage, the concentrate being fed should usually contain about 10 percent crude protein, as shown in Table 3. Mares receiving typical quality (7.5 percent crude protein) grass hay or grazing, or average quality alfalfa (15 percent crude protein), will usually require a higher protein concentrate such as the 14 percent mix shown in Table 4. Careful attention to the protein balance of the diet at this stage can help prevent problems with foal growth.

Brood mares that were previously maintained solely on hay or grazing should be introduced to grain feeds slowly. Likewise, mares being switched from grass to legumes should be changed over gradually so as to minimize digestive upset. Where concentrate



intake is less than .5 percent of body weight (6

Figure 2. Growth of equine conceptus in early/mid/late gestation.

pounds of grain/1,100-pound mare), this amount usually can be provided in one daily feeding. Larger amounts should be provided in two feedings at regular intervals.

Some brood mare operations may use small grain pastures for mares in late pregnancy, in which case mares will normally receive most of their requirements from oats, ryegrass or wheat pastures. However, some supplemental feeding (10 percent crude protein) usually is needed to maintain body condition.

As mentioned previously, feed grade rendered fat can be incorporated into the concentrate to increase the energy content of the grain feed rather significantly. Table 5 shows an example of a brood mare ration that contains 5 percent added fat. Compared to the grain mix shown in Table 4, this mixture provides almost 10 percent more energy per pound of feed. When such a ration is prepared with lard, the owner
should not mix large amounts of feed that will require lengthy storage. These fat-added rations can become rancid and cause mares to go "off feed."

Research has shown that high fat diets can put weight on mares that are in unsatisfactory body condition. The advantage of feeding fat in late pregnancy is that body condition can be improved without having to feed excessive amounts of concentrate on a daily basis. With a 5 percent added fat ration such as that shown in Table 5, a mare usually can be maintained in the same body condition with 7 to 15 percent less feed (by weight) than would be needed with the ration shown in Table 4. However, fat-added mixes should be introduced to horses slowly and the grain mix should not contain more than 10 percent added fat.

Lactation

At foaling, a mare's daily nutrient requirements increase significantly. The lactating mare requires more protein, energy, calcium and phosphorus in a larger amount of feed in order to recover from foaling stress, to produce milk and to rebreed (Tables 1 and 2).

Research has shown that mares produce an average of 24 pounds (3 gallons) of milk daily during a 5-month lactation. This represents 450 gallons or 1 3/4 tons of milk over a 150-day period. High producing mares give as much as 32 pounds (4 gallons) of milk daily,

while even the lowest milkers often produce 21 pounds (2.5 gallons) of milk daily. Results of similar research indicate that mares produce an average of 26.5 pounds of milk during the first 22 days of lactation.

Table 3. Brood mare ration to be fed with top quality alfalfa hay during late pregnancy.*

Ingredients	Percent	Pounds/ton
Oats	50.00	1000
Cracked corn	45.00	900
Molasses	3.00	60
Dicalcium phosphate	1.00	20
Ground limestone	.50	10
Trace mineralized salt	.50	10
Vitamin A	+	+
	100	2000

Calculated Analyses
C.P. = 10.0%
Dig. energy = 1.39 mcal/lb.
Crude fat = 3.5%
Calcium = .51%
Phosphorus = .49%
Vitamin A = 2,500 IU's/lb.

Add 5 million IU's Vitamin A/ton.

Average daily intake levels (roughage + concentrate) of an 1,100-pound mare.

	Alfalfa hay	Concentrate	Total
Late gestation	13-14 lbs.	4-5 lbs.	17-19 lbs.

*** Important: Read the sections on roughages and concentrates regarding potential problems with feedstuffs.**

Table 4. Brood mare ration to be fed with good quality hay or grazing during late pregnancy and lactation.*

Ingredients	Percent	Pounds/ton
Oats	40.00	800
Cracked corn	40.00	800
Soybean meal	15.00	300
Molasses	3.00	60
Ground limestone	0.75	15
Dicalcium phosphate	0.75	15
Trace mineralized salt	0.50	10
Vitamin A	+	+
	100	2000

Calculated Analyses
C.P. = 14.8%
Dig. energy = 1.4 mcal/lb.
Crude fat = 3.3%
Calcium = .59%
Phosphorus = .50%
Vitamin A = 2,500 IU's/lb.

Add 5 million IU's Vitamin A/ton.

Average daily intake levels (roughage + concentrate) of an 1,100-pound mare.

	Roughage	Concentrate	Total
Late gestation	11-12 lbs.	6-7 lbs.	17-19 lbs.

Lactation	11-12 lbs.	13-14 lbs	24-26 lbs.

***Important: Read the sections on roughages and concentrates regarding potential problems with feedstuffs.**

Table 5. Fat-added ration to be fed with good quality hay or grazing during late pregnancy and lactation.*

Ingredients	Percent	Pounds/500 pounds
Oats	35.00	175
Cracked corn	35.00	175
Added fat	5.00	25
Soybean meal	20.00	100
Molasses	2.00	10
Ground limestone	0.75	3.75
Dicalcium phosphate	1.25	6.25
Trace mineralized salt	1.00	5.00
Vitamin A	+	+
	100	500

Calculated Analyses
C.P. = 16.2%
Dig. energy = 1.51 mcal/lb.
Crude fat = 8%
Calcium = .67%
Phosphorus = .58%

Vitamin A added at 2,500 IU's per pound.

Average daily intake levels (roughage + concentrate) of an 1,100-pound mare.

	Grass hay	Concentrate	Total
Late gestation	11-12 lbs.	5-6.5 lbs	16-18.5 lbs.
Lactation	11-12 lbs.	12-13 lbs.	23-25 lbs.

***Important: Read the sections on roughages and concentrates regarding potential problems with feedstuffs.**

Underfeeding of mares during early lactation will surely lower milk production and cause weight loss. While certain mares may lose weight during peak milk production, this does not normally pose a problem if the mare is in fleshy to fat condition. **However, early lactation weight loss in mares that foal in thin condition will often lengthen rebreeding time, lower conception rates and threaten the subsequent pregnancy.**

A lactating mare usually requires between 2 and 3 percent of her body weight in total feed (hay + grain) daily. Requirements can be met using the rations described in Tables 4 and 5. Including fat in the diet can increase the fat content of the milk, which may help nursing foals grow. Furthermore, fat-added diets can be helpful in maintaining mares that are hard keepers and prone to significant weight loss during lactation.

Regardless of the concentrate being fed, the increase in daily feed intake compared to that needed during gestation should be made gradually in order to prevent founder. Allow 1 week to 10 days for mares to adjust to intake changes. Providing the total daily feed in two equal feedings allows mares to safely consume the amounts needed during lactation. Heavy milkers may require as much as 1.75 to 2.0 percent of body weight in concentrate feed each day, in addition to hay or grazing. When possible, group-fed mares should be grouped according to feed intake so as to carefully control the amounts they consume. Individual feed troughs are very helpful in managing feed intake by mares fed in groups.

Free choice spring grazing will meet some of the mare's nutrient requirements, but considerable amounts of supplemental feed will be needed. Less supplemental feed will be needed for mares on small grain pastures. In

most cases, body condition of mares on high quality pasture can be maintained with concentrate provided at .75 to 1.25 percent of body weight daily.

In the fourth, fifth and sixth months of lactation, daily requirements begin to decline. Although milk volume decreases little over a

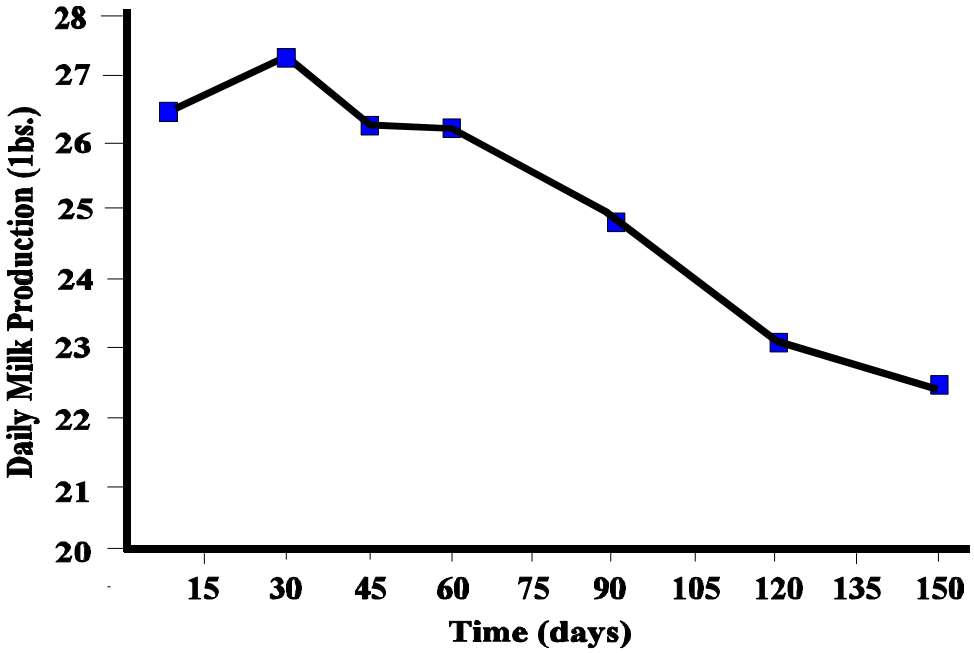


Figure 3. Average daily milk production in mares.

5-month period, "strength" (as measured by energy content of the milk) decreases significantly. Mares allowed free choice grazing and those being fed hay will require less supplemental feed than during early lactation. In the fourth month of lactation, a mare's milk provides less than 30 percent of the total energy needed by her foal. By this time, many horsemen will have foals on a good creep feed to prepare them for weaning. Once the foal is weaned, the dry, pregnant mare can be managed as an early gestating mare once again.

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