ADM

The Technical Edge

Are You Feeding Your Horse Like a Horse?

Over the last few decades, the amount of research conducted on equine nutrition topics has continuously increased. Because of this, we now have a better understanding of metabolic disorders and their relationship to diet. We now know that traditional feeding programs can result in many health-related problems in horses. Fortunately, we also have many more choices of feeds available for horse rations. Instead of just forages and grains, we now have fermentable fibers (beet pulp and soybean hulls) and high-fat supplements (vegetable oils, stabilized rice bran and Omega Flax™) at our disposal.

TABLE 1

General Digestible Energy (DE) Requirements of Horses

Class	Weight, lb	Mcal DE, daily
Maintenance	1,100	16.7
Intense work	1,100	34.5
Lactation, 1-3 mo	1,100	31.3
Growth	385-990	15-22
Growth & training	990	27.9

Adapted from NRC, 2007.

TABLE 2

Expected Feed Consumption by Horses (% body weight)*

Class	Total
Mature Horses	
Maintenance	2.0-2.5
Mares, late gestation	2.0-2.5
Mares, early lactation	2.5-4.0
Mares, late lactation	2.5-3.5
Working Horses	
Light work	2.0-3.0
Moderate work	2.25-3.5
Intense work	2.5-4.0
Young Horses	
Nursing foal, 3 mo	3.0-4.0
Weanling foal, 6 mo	2.5-4.0
Yearling foal, 12 mo	2.5-3.5
Long yearling, 18 mo	2.5-3.0
Two-year-old, 24 mo	2.25-3.5

*Air-dry feed (about 90% dry matter).

Adapted from NRC, 2007.

Meeting Horse Energy Requirements

Horses require about 15 to 34.5 Mcal of digestible energy (DE) per day, depending on the size, class, and workload of the horse (Table 1). Horses are expected to consume about 2-4% of their body weight in feed daily (Table 2). For example, a horse weighing 1,100 lb will consume 22 to 44 lb of feed daily. Forages typically provide 0.6 to 1.0 Mcal of digestible energy (DE) per lb. Consumption of 25 lb of hay with a DE content of 0.9 Mcal/lb will provide 22.5 Mcal of DE. This much energy is enough for all classes of horses except hard-working horses and lactating mares. In fact, many horses can obtain most of their required energy from good-quality forages alone. Table 3 lists the digestible energy content of commonly used horse feeds and Forage First products.

One must start with forage, not with grains, when formulating horse rations.

Comparing Traditional & Forage First® Programs

Let's compare the traditional and Forage First horse feeding programs (Tables 4 and 5). Traditional horse feeding programs:

- Are grain-based.
- Often include poor-quality forages.
- Include salt, but lack many other important vitamins and minerals.
- Usually include several specific supplements for different problems.

These programs have led to situations where horses may be deficient in some nutrients and overfed others and often suffer from disorders such as colic, founder, gastric ulcers, and tying-up and have poor-quality hooves, skin, and hair. In fact, data from surveys of horse owners reveal their main concerns are colic, founder, and poor hoof quality. Research has shown that if horses are fed more like the grazing, fiber-fermenters they are, the risks of many common metabolic disorders can be reduced while enabling the equine digestive tract to get the most benefit from the feeds provided. This means one must start with forage, not with grains, when formulating rations.

Cereal grains have become the basis of traditional feeding programs because they contain more energy per pound than forages. However, since the equine digestive tract is not designed to process large amounts of grain, high-grain rations often result in metabolic disorders (Figure 1). Horse feeds can be classified, according to their DE content, into four categories — hays, fermentable fibers, grains, and fat supplements (Table 3). In situations where additional energy is needed, fermentable fibers and high-fat feeds can be used, so that less cereal grains are required. Forage First programs begin with the forage (Table 5 and Figure 2). Then, since all forages are deficient in some minerals and vitamins for horses, GROSTRONG vitamin/mineral products are provided. When more energy is needed, stabilized rice bran and Omega Flax products, which provide energy in the form of highly digestible fat

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FIGURE 1

Traditional Horse Feeding

When fed two large meals of grains daily, the "hungry" horse can consume a meal in less than an hour. Inclusion of molasses will cause faster intake. Less water is consumed with grains than hays.

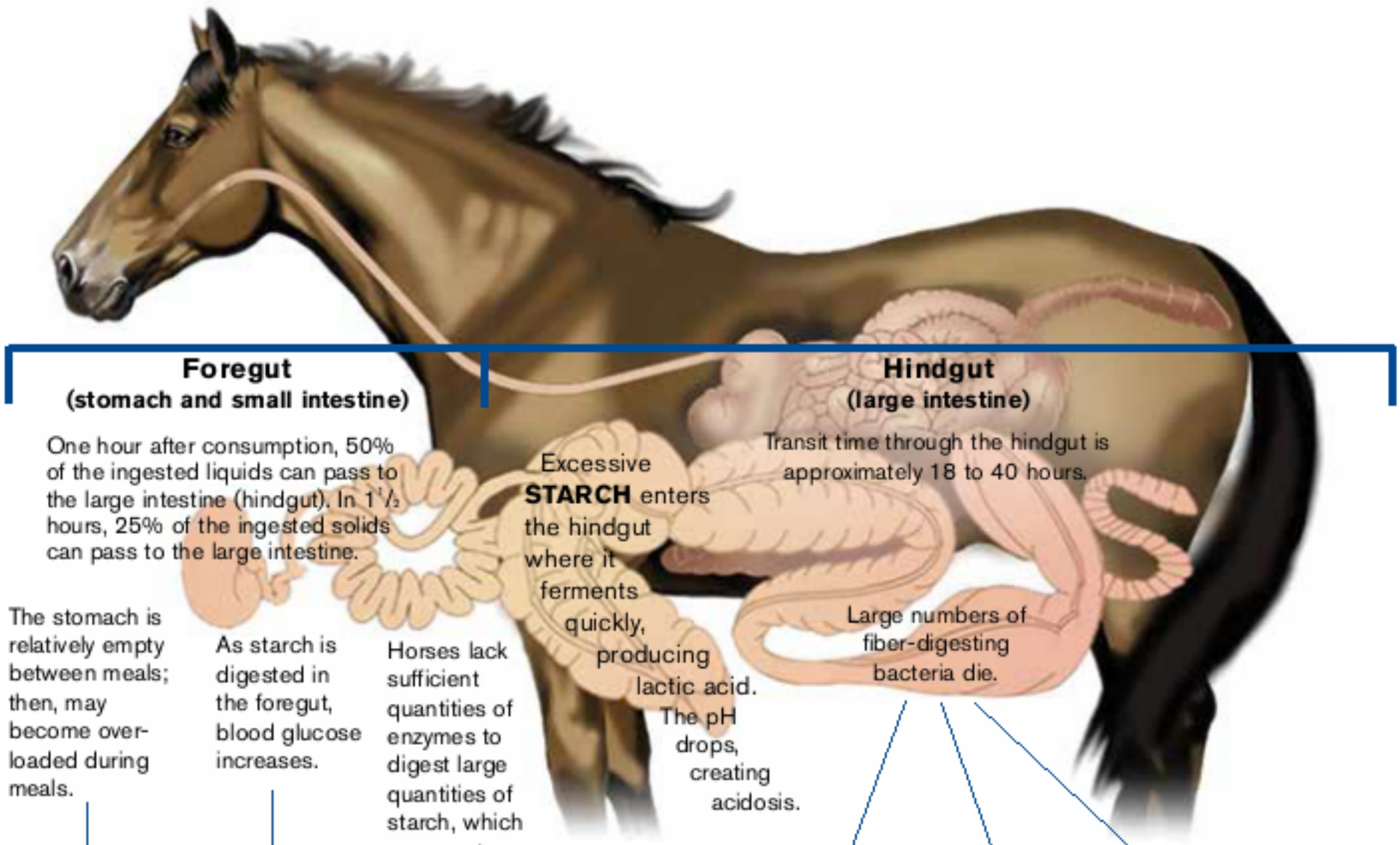
More grain and less forage is fed. **POSSIBLE RESULT**: inverse calcium:phosphorus ratio, which can lead to bone disorders.

Salt blocks do not provide enough calcium, phosphorus, and magnesium (major minerals) or copper, zinc, selenium, iron, and manganese (trace minerals). **POSSIBLE RESULTS**: reduced digestibility of carbohydrates, protein, and fat; poor performance; **TYING-UP**.

Salt blocks are not adequately consumed. **POSSIBLE RESULTS**: dehydration, poor performance, impaction, **COLIC**.

Since the horse is typically fed only twice daily, a period of time elapses between feedings, which causes feed to move more quickly through the foregut. Consequently, there is insufficient time for complete absorption of carbohydrates, fat, and protein.

Feeding low-quality forages places coarse fibers in the digestive tract. **POSSIBLE RESULTS**: impaction, constipation, **COLIC**.



Foregut
(stomach and small intestine)

One hour after consumption, 50% of the ingested liquids can pass to the large intestine (hindgut). In 1½ hours, 25% of the ingested solids can pass to the large intestine.

The stomach is relatively empty between meals; then, may become overloaded during meals.

POSSIBLE RESULTS: "cranky attitude," **ULCERS, gastric rupture.**

As starch is digested in the foregut, blood glucose increases.

POSSIBLE RESULT: **"grain-high" attitude.**

Horses lack sufficient quantities of enzymes to digest large quantities of starch, which can create a starch overload in the foregut.

POSSIBLE RESULTS: loss of appetite, digestive distress, **COLIC**.

Hindgut
(large intestine)

Transit time through the hindgut is approximately 18 to 40 hours.

Excessive **STARCH** enters the hindgut where it ferments quickly, producing lactic acid. The pH drops, creating acidosis.

Large numbers of fiber-digesting bacteria die.

Greatly reduced production of B vitamins and vitamin K. **POSSIBLE RESULTS**: poor hair coat, brittle hooves, reduced energy, lack of exercise tolerance, **TYING-UP**.

Decreased digestibility of fibers. **POSSIBLE RESULTS**: poor performance, diarrhea, **TYING-UP**.

Excessive endotoxins released from dead bacteria. **POSSIBLE RESULTS**: gas production and **COLIC**. Consequently, toxins enter the blood stream causing **SHOCK** and **LAMINITIS**.

→ **FOUNDER**

FIGURE 2

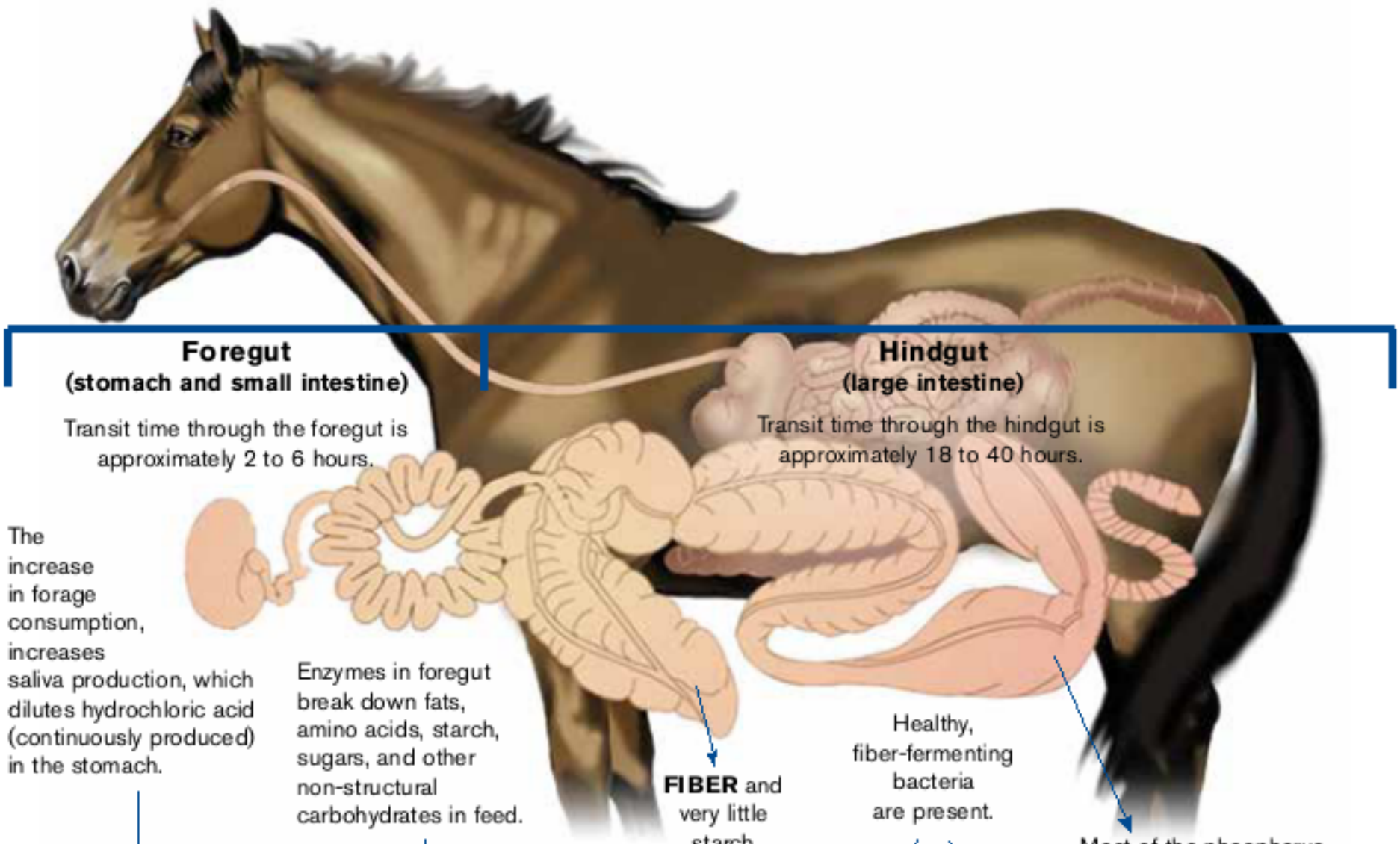
FORAGE FIRST Program

Good-quality forages provide more digestible carbohydrates, proteins, vitamins, and minerals.

Small meals of Mineral-Vitamin Products and Concentrated Energy Supplements are easily digested in the foregut. Specialized Premium Blends and Fortified Feeds are fed at a maximum of 3 lb/meal, except for complete feeds which contain forage. **RESULT**: Increased digestibility of protein and fiber.

Adequate salts and water allow for free-flowing digesta without excessive gas or impactions.

Almost continuous intake of forage (pasture and/or hay). **RESULT**: minimal time when digestive tract is "empty" or "full."



Foregut
(stomach and small intestine)

Transit time through the foregut is approximately 2 to 6 hours.

Hindgut
(large intestine)

Transit time through the hindgut is approximately 18 to 40 hours.

The increase in forage consumption, increases saliva production, which dilutes hydrochloric acid (continuously produced) in the stomach.

RESULTS: good appetite, minimal chance of ulcers and digestive distress.

Enzymes in foregut break down fats, amino acids, starch, sugars, and other non-structural carbohydrates in feed.

Most dietary protein, energy sources, vitamins, and minerals are absorbed — 60% protein, 100% soluble carbohydrates, 95% fat, and natural vitamin E. **RESULT:** reduced feed costs.

FIBER and very little starch enter the hindgut. Normal pH of 6.5 is maintained.

Healthy, fiber-fermenting bacteria are present.

Up to 70% of energy comes from volatile fatty acids produced by bacteria digesting good-quality fiber. **RESULTS**: controlled energy, increased exercise tolerance and performance, faster recovery from exercise.

Most of the phosphorus, 75–85% of the structural carbohydrates (absorbed as volatile fatty acids), and 30% of the digested protein are absorbed from the hindgut. **RESULTS:** fewer digestive problems, reduced feed costs.

Optimum production of vitamin K and B vitamins including biotin. **RESULTS**: shiny hair coat, optimum hoof quality.

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and fibers, should be used. ADM's Premium Hi-Fat Supplements and Premium Blends also provide essential fatty acids, B-complex vitamins, and many antioxidants including natural-source vitamin E. For convenience, ADM's Fortified Feeds can be used to provide additional energy along with protein, vitamins, and minerals.

Changing to a Forage First Program

How does one change horses from a traditional program to a Forage First program? Ideally, forages should be analyzed for nutrient content. If a consistent source of forage is not attainable, book values for energy, protein, and other nutrients can be used. If forage is of questionable quality, find a better forage source. When selecting hay, avoid mature grass hays containing less than 8% protein. These forages tend to be very high in indigestible fiber and low in energy. Select immature hays that are mostly grass with some legume. Pure alfalfa hays are generally too high in protein and calcium for most rations, even though their high DE content would be of benefit. Forage First Timothy/Alfalfa or Alfalfa Cubes can be used as high-quality partial or complete forage sources.

Refer to Table 5, choose from the options in the forage box, then the vitamin-mineral box. Next, choose a Premium Hi-Fat Supplement if an energy source is needed. For convenience or personal preference, Premium Blends or Fortified Feeds (noted in the fourth box) are an option which can be used to complete the ration. Forage First programs provide nutrients required for optimum performance and reduce the risks of underfeeding, oversupplementing, and metabolic disorders associated with starch overload, such as colic, founder, ulcers, and tying-up.

ADM offers a toll-free HELPLINE. To obtain assistance, call 1-800-680-8254.

More information can be found at ADM's online library at ADMequine.com.

ADM Animal Nutrition, a division of Archer Daniels Midland Company, PO Box C1, 1000 N 30th St, Quincy, IL 62305-3115

800-680-8254 • ADMequine.com

TABLE 3

Digestible Energy Content of Horse Feeds

	Mcal/lb (as-fed)
Hays	**0.6-1.0**
alfalfa, early bloom	1.0
grass, early bloom	0.8
Fermentable Fibers	**1.3**
beet pulp	1.3
soybean hulls	1.3
Grains and Feeds	**1.2-1.5**
molasses, sugar beet	1.2
oats	1.3
corn	1.3
barley	1.5
Fat Supplements	**3.9-4.1**
vegetable oil (1.9 Mcal/cup)	4.1
animal fat	3.9
FORAGE FIRST Products	
HEALTHY GLO®	1.9 (2.4)*
MOORGLO®	1.8 (2.1)*
POWERGLO®	1.7 (1.8)*
PRIMEGLO®	1.6 (1.7)*
SENIORGLO®	1.6 (1.7)*
JUNIORGLO®	1.5 (1.6)*
Patriot® *Ultra-Fiber*	1.5
Patriot® Performance	1.5
Patriot Mare & Foal	1.5
Patriot Senior Complete	1.55

**replaces due to extra-caloric effects*

TABLE 4

Traditional Horse Feeding

1 GRAIN PRODUCTS
Often have very little or no vitamin-mineral fortification.
A. 8-12 lb of sweet or pelleted feed
B. 8-12 lb of oats, corn, or COB (corn, oats, and barley)

Plus

2 FORAGE
A. 5-8 lb of poor-quality hay (6-8% protein)
B. Mature pasture part of the day

Plus

3 SALT
A. Salt block, free-choice
B. Trace mineral salt block, free-choice

Plus

4 SUPPLEMENTS
An average of 3-5 supplements for different problems.

TABLE 5

Forage First Program

1 FORAGE*
Combine choices A, B, and/or C.
A. Good-quality pasture
B. 15-30 lb good-quality hay (8-15% protein)
C. Forage First Hay Cubes or Hay Replacer
*Forage First Horse Rewards (treats) are also available.

Plus

2 Vitamin/Mineral Products
Choose from the following:
A. GROSTRONG Minerals; 1-3 oz
B. GROSTRONG Mineral Block in pasture
C. GROSTRONG QuadBLOCK® in stall
D. StaySTRONG™ Metabolic Mineral Pellets (limited starch); 1-2 lb
E. StaySTRONG 33 Ration Balancer (pelleted, contains 33% protein); 1-2 lb
F. PRO-VITA-MIN™ 20 Tub; 1-2 lb
G. Patriot 36 Ration Balancer; 1-2 lb

Plus

3 Premium Hi-Fat Supplements
Choose from the following:
A. ½-1½ lb HEALTHY GLO Nuggets
B. ¼ lb - 1 lb HEALTHY GLO Meal
C. 1-3 lb MOORGLO

And/Or**

4
Choose from the following for convenience or personal preference (hay can be reduced to a minimum of 2% of body weight):

Premium Blends (contain stabilized rice bran)
A. JUNIORGLO; 4-8 lb
B. PRIMEGLO; 2-4 lb
C. POWERGLO; 4-8 lb
D. SENIORGLO; 4-8 lb

or

Fortified Feeds
A. Patriot *Ultra-Fiber* Horse Feed
B. Patriot Performance Horse Feeds

**Depending on the feeding program, Step 4 may replace Steps 2 and 3 or partially substitute for products listed in Steps 2 and 3.

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