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Feeding the Performance Horse

Larry A. Lawrence

WASHINGTON STATE UNIVERSITY
EXTENSION

The horse has an enormous capacity for physical work. Its athletic potential for speed, endurance, and agility renewed its popularity in sports events such as endurance riding, three-day events, and cutting competitions. A horse's inherent athletic ability is highly dependent on genetics. Certain breeds and lines of horses are better suited for specific events. Horses should be selected for particular activities based on genetic potential, then trained and conditioned for that specific activity.

Table 1. Determining the Horse's Weight.

Girth length (inches)	Weight (lbs.)
30.0	100
40.0	200
45.5	300
50.5	400
55.0	500
58.5	600
61.5	700
64.5	800
67.5	900
70.5	1,000
73.0	1,100
75.5	1,200
77.5	1,300

Source: Lewis 1982.

As we continuously challenge the horse's performance abilities, we seek the finished horse, an animal that has peaked in its training and conditioning program. The trainer is responsible for the level of fitness a horse has for a specific activity. Two very important systems help determine the success of a performance horse:

1) Nutrition/energy metabolism—the supply of energy and its utilization.

2) Conditioning/fitness—the mechanics of gait, coordination, and muscular strength.

Nutrition and conditioning development programs are closely related to and dependent on each other. One of the best ways to evaluate a horse's condition and nutritional status is by body weight and/or condition scores. Livestock scales are needed for accurate determination of weight, and accurate weights are very helpful in predicting performance. If scales are not available then equine weight tapes can be used to estimate body weight. However, they are not accurate enough to monitor changes that may affect performance. For example, a difference of 1% in the horse's weight (11 lbs. in a 1,100-lb. horse) can affect performance of race horses.

Table 1 contains conversions from inches measured around the heart girth to estimated weight. A condition score system (Figure 1) has been developed at Texas A&M based upon visual appraisal and palpable fat cover. Horses are rated from emaciated to extremely fat. Horses should be fed based upon a percentage of their body weight (Table 2). Once the horse's weight has been estimated you can calculate the amount of feed it will require. Don't measure feed by volume; weigh it on a scale (Table 3).

Conditioning Program

It is difficult to separate condition and fitness from nutrition in performance horses. The horse that has been laid off for the winter may come into the season underweight or overweight. So, part of the program may include weight gain or reduction.

A good fitness conditioning program combined with proper nutrition influences energy use. The performance horse uses 80–90% of its feed for energy metabolism. The muscles can actually be trained to use energy substrates (carbohydrates and fats) more efficiently. There are two general muscle fiber groups: fast twitch and slow twitch muscle fibers. Glycogen (carbohydrate) is the stored form of energy that hard-working fast twitch muscle fibers use most. Research has shown that glycogen can be increased by 33% during a conditioning program of 10 weeks. Slow twitch fibers are associated with

Table 2. Expected Feed Consumption.*

	Forage	Concen-trate	Total
Mature Horses	- - - - - - -	% body wt.	- - - - - - -
Maintenance	1.5–2.0	0–0.5	1.5–2.0
Working			
Light	1.0–2.0	0.5–1.0	1.5–2.5
Medium	1.0–2.0	0.75–1.5	1.75–2.5
Intense	0.75–1.5	1.0–2.0	2.0–3.0
Young Horses			
Yearling foal (12 mo.)	1.0–1.5	1.0–2.0	2.0–3.0
Long yearling (18 mo.)	1.0–1.5	1.0–1.5	2.0–2.5
2-yr.-old (24 mo.)	1.0–1.5	1.0–1.5	1.75–2.5

*Air dry feed 90% dry matter.
Source: NRC 1989.

endurance-type activities. Endurance conditioning can increase the aerobic capacity, or ability to deliver and utilize oxygen and energy-rich fatty acids. Both groups of muscle fibers respond to endurance training by increasing the aerobic capacity. This is one key to a good conditioning program.

Table 3. Volume to Weight Conversions.

1-lb. coffee can=	1 lb. oats 0.5 lb. bran or beet pulp 1.5 lbs. corn, other cereal grains, or protein supplements

Source: Lewis 1982.

There are many ways to condition horses. The best conditioning programs increase aerobic capacity and prepare them for the actual work they will perform (Table 4). One conditioning system is known as interval training. Interval training builds horses up gradually to the actual work that will be expected of them. Interval training stresses the horse's cardiovascular and locomotor systems during repeated short exercise bouts interrupted by rest or recovery periods. This work-rest system builds resistance to the stress of exercise and slowly conditions horses to their maximum potential.

Monitoring heart rates is a good way to determine the effectiveness of the conditioning program. At heart rates above 150–180 beats/minute, muscular energy supplies, and the cardiovascular system cannot keep up with the demands. One of the results of this type of work is that fuel is burned without oxygen, or anaerobically.

At heart rates below 100–150 beats/minute mostly aerobic work is being performed. Aerobic work is slow, distance work that the horse can do for long periods of time before fatigue. This simplified explanation provides an idea of how hard a horse is working during various activities.

Fatigue and Energy Metabolism

The association between fitness and nutrition can also be seen in fatigue. Equine exercise physiologist D. F. McMiken reports there are three types of fatigue: (1) structural fatigue—weakened and damaged bone, tendons, or muscle fiber damage, resulting in tying up (muscle spasms) and soreness; (2) chronic fatigue—starvation, muscle glycogen depletion; and (3) acute fatigue—end-of-race, glycogen depletion, reduced energy substrates, increased lactic acid and lowered pH in the muscle and blood.

All performance events require the use of anaerobic and aerobic energy metabolism. Anaerobic exercise, or speed work, is partially limited by the horse's ability to metabolize or burn fuels efficiently. Stored muscle glycogen is the predominant source of fuel for high-intensity speed work. At high speeds muscle glycogen metabolism occurs at a rate that limits the use of oxygen in the fuel-burning process. All fuels burn more efficiently in the presence of oxygen. Anaerobic glycolysis, or the burning of glycogen without oxygen, is inefficient and results in the production of lactic

Table 4. Conditioning Schedule for Starting Mature Horses.

Activity	Duration	Heart Rates	Results
<u>All Horses</u> Walk and trot 30 min. at 5 mph. Build to 10 mph.	3–6 mo.	Below 150 beats/min.	Strengthen bones and muscles. Improve elasticity of cartilage, tendons, and ligaments.
<u>Speed Event Horses</u> Fast gallop 200 yards uphill followed by 4-min. walk. Repeat 5–10 times.	40–60 days	Work: above 150 beats/min. Walk: below 100 beats/min.	Strengthen muscle. Increase muscle glycogen. Decrease lactic production. Decrease fatigue.
<u>Endurance Event Horses</u> Gallop, approximately 80% at maximum speed 3–4 min. Repeat 3–4 times.	40–60 days	Work: between 100–150 beats/min. Rest: below 100.	Increase strength, endurance, and aerobic capacity.

Source: Snow 1984.
Psychological factors must be considered in conditioning programs; vary programs to avoid boredom. Conditioning must include the actual activity for which the horse is being trained.

Table 5. Nutrient Composition of Forage.

	DE Mcal/lb	CP - - - - -	Ca - - % - -	P - - - - -
Early timothy	1.04	11.4	0.36	0.26
Late timothy	0.75	8.6	0.18	0.14
Early alfalfa	1.0	18.5	1.54	0.25
Late alfalfa	0.86	13.0	1.20	0.22

Source: NRC 1989.
DE=Digestible energy CP=Crude protein Ca=Calcium
P=Phosphorus

Table 6. Relationship of Forage Maturity to the Nutrient Requirements for the Performance Horse (1,100) lbs.) Doing Light Work.

	DE - - - - -	CP - grams	Ca - - - - -	P - - - - -
Requirement	20.5	818	25.0	17.8
Timothy hay (early 20 lbs.)	20.8	1040	33.1	24.1
Timothy hay (late 20 lbs.)	15.0	873	16.3	12.7
Alfalfa (early 20 lbs.)	20.0	1684	140.6	22.8
Alfalfa (late 20 lbs.)	17.2	1179	108.9	20.0
Alfalfa (late 27.5 lbs.)	23.7	1640	149.8	27.5

Source: NRC 1989.
DE=Digestible energy CP=Crude protein Ca=Calcium
P=Phosphorus

acid. Although researchers no longer believe that lactic acid is the main cause of fatigue, they still believe it is one factor leading to fatigue. The conditions that create lactic acid buildup also cause pH to decrease in muscles, which creates a more acidic environment and leads to fatigue.

Aerobic exercise is more efficient than anaerobic exercise because the horse can deliver adequate oxygen to burn fuels. Energy for aerobic exercise is derived from glycogen and stored body fat and/or free fatty acids. These fuels are burned efficiently in the presence of oxygen with little buildup of lactic acid. While aerobic exercise is more efficient, it can result in glycogen depletion and fatigue if the work is prolonged.

Nutrition

After you have evaluated your horse's condition and weight and planned a fitness conditioning program, develop a nutritional program for each horse. The program must be designed primarily to supply energy to mature horses. The program can be monitored by feeding the horses to maintain a particular body weight and level of fatness.

Energy

The energy requirements for individual horses doing the same amount of work can vary as much as 30%. Energy can be obtained from structural plant carbohydrates found in forages (cellulose), simple carbohydrates found in grain (starch), protein, and fat. The energy requirements can be measured as digestible energy (DE) in megacalories (Mcal).

A mature horse at maintenance (normal daily activities, grazing, etc.) or performing one hour of light work per day (walking, slow trotting, some cantering, or a pleasure ride) can perform well on a diet of alfalfa or immature timothy hay, if supplemented with trace minerals and a clean, fresh water supply. The nutrient content of forage is determined by its stage of growth or maturity. More mature forage contains less available energy, protein, and other nutrients. Immature forage is more nutritious. Tables 5 and 6 illustrate the effects of maturity of timothy and alfalfa hay on the forage's nutrient content, and how it relates to the requirements of a horse doing one hour of light work.

Sometimes you may want to limit hay intake (never limit hay below 1% of body weight, 11 lbs. hay for 1,100-lb. horse) and supplement with grain (Table 7). Many "hard keepers" cannot maintain proper condition without grain. Also, some horses fed large amounts of mature hay develop "hay belly." The feedstuffs used in Table 7 are a typical timothy hay and commercial diet designed to be fed with grass hay. Grain can be a commercial grain mix, either a textured feed with whole or rolled grains or a ground pelleted feed. Grains such as oats, corn, and/or barley can be used singly or in combination. If you feed grain alone, add two ounces (60 grams) of a trace mineral supplement per day.

The energy required for work depends on the amount of time spent working and the intensity of the work. Nutritional programs are divided into two categories, those for long, low-intensity, activities and those for short, high-intensity activities. Horses in the first category are endurance and competitive trail horses, draft or ranch work horses, and other horses ridden or driven moderately several hours per day. When the intensity of work or the time spent working is increased, increase the dietary energy.

High-intensity activities where the horse performs at 80–100% of its maximum ability for a short duration include racing, polo, three-day eventing or cross-country. In these types of activities much of the energy must come from stored carbohydrates or glycogen derived from the grain portion of the ration (Table 8). The high levels of grain fed in this example should only be fed to intensely worked horses. Very few recreational horses are in this category.

Light work for two or three hours per day may increase energy requirements 50% above maintenance. If a horse performs a moderate workload (fast trotting, cantering, ranch work, cutting, jumping, etc.) four or five hours a day, the energy requirement may be increased 70% above maintenance. It is impossible for a horse to consume enough hay to meet his or her energy needs at these workloads. To further complicate matters, horses that are worked several hours a day may not want to eat enough feed to maintain desired levels of fatness. To overcome this, increase the energy density of the ration. Grain has 40–60% more digestible energy than hay. Fat contains more energy than grains. Adding fat to the diet can increase the energy density without increasing the amount of grain or limiting the amount of hay.

A horse weighing 1,100 lbs. and performing medium work requires 24.6 Mcal of digestible energy per day. If alfalfa hay is fed at 1.36% of body weight, or 15 lbs., then 6 lbs. of grain should also be fed (Table 9). The diet in Table 10 shows the result of feeding late timothy hay to a horse doing moderate work. Ten and one quarter pounds of oats are needed to meet the energy needs. The calcium and phosphorus must also be balanced.

The energy density of a horse's diet can be increased by (1) feeding a higher quality hay, (2) adding grain, or (3) adding 10% fat (such as corn oil) by weight. Fats contain 3 times as much energy as oats and 2.5 times as much energy as corn. Vegetable fat can be added up to 10% of the grain portion of the diet by weight. A typical use of fat in the diet might begin with the addition of 1/2 cup per feeding. If the horse is fed twice per day then it would be eating 1 cup (1/2 lb.) of oil, which would supply about as much energy as 1.5 lbs. of oats. If you were feeding 2 cups (1 lb.) of fat per day, then you could decrease the amount of grain being fed by up to 3 lbs. Horses should not receive more than 1 lb. or 2 cups of fat per day.

Protein

Protein requirements are very low for mature horses. However, long yearlings or 2-year-olds need additional protein for growth. A mature horse needs less than 10% crude protein (CP) in its diet, but 2-year-olds in training should get 12–14%

Table 7. Feeding the Performance Horse (1,100 lbs.) Doing Light Work.

	DE Mcal	CP - - - - -	Ca grams- -	P - - - - -
Requirement	20.5	818	25.0	17.8
Timothy hay[a] (11 lbs.)	10.0	480	20.5	12.5
Additional nut-rients needed	10.5	338	4.5	5.3
Concentrate[b] (8 lbs.)	10.5	364	23.6	16.4
Total	20.5	844	44.0	28.9

Source: NRC 1989.
[a]Timothy hay 0.90 Mcal/lb. DE; 9.6% CP; 0.41% Ca; 0.25%, P
[b]Concentrate 1.31 Mcal/lb. DE; 10% CP; 0.65% Ca; 0.45% P
DE=Digestible energy CP=Crude protein Ca=Calcium P=Phosphorus

Table 8. Feeding the Performance Horse (1,100 lbs.) Doing Intense Work.

	DE Mcal	CP - - - - -	Ca - grams	P - - - - -
Requirement	32.7	1309	40.0	28.5
Timothy hay[a] (11 lbs.)	10.0	480	20.5	12.5
Additional nut-rients needed	22.7	829	19.5	16.0
Concentrate[b] (17.3 lbs.)	22.7	880	52.0	36.0
Total	32.7	1360	72.7	48.5

Source: NRC 1989.
[a]Alfalfa hay 1.04 Mcal/lb. DE; 18.7% CP; 1.37% Ca; 0.24%, P
[b]Concentrate 1.31 Mcal/lb. DE; 11% CP; 0.65% Ca; 0.45% P
DE=Digestible energy CP=Crude protein Ca=Calcium P=Phosphorus

CP. Mature horses fed grass hay should be supplemented with a 12% CP grain diet. Alfalfa hay-based diets should be supplemented with 10% CP grain mixes.

Vitamins

Vitamin nutrition in the horse has received little attention from researchers in the past. This is mainly because the mature horse consuming high-quality forage does not need vitamin supplements. Vitamin D and K deficiencies have never been demonstrated naturally in the horse. Horses synthesize vitamin K in the large intestine and vitamin D is supplied in sun-cured hay and synthesized in the skin in the presence of sunlight.

Vitamin E and selenium work together to protect cell membranes. Vitamin E, unlike selenium, is difficult to oversupplement. Vitamin E levels are variable in forages and hard to predict without analysis. Performance horses should receive 1,000 mgs. of vitamin E per day. This is especially important if vegetable oil has been added to the diet.

Hay that has been stored for a year will lose much of its vitamin A. If you use this quality of forage, give the horse 20,000 international units (IU) per day of vitamin A.

Water soluble vitamins are synthesized in the large intestine and supplementation is usually not necessary. However, horses working moderately to intensely and receiving high grain diets need additional B vitamins. Folic acid should also be added to the diet.

The levels of supplementation have not been determined for all situations and depend on the amount and quality of the forage and the amount of stress the horse is under. Thiamin should be supplemented in the moderate to intensely worked horse, 70 mg per day.

Minerals

A balance of calcium and phosphorus is important. Calcium (Ca) and phosphorus (P) are macrominerals important in muscle and nerve function and energy metabolism. Most of the body's Ca and P are stored in the bone. Many of the bone and joint disorders in young horses are due to imbalances of these minerals. Grains are high in P. If grass hays that are low in Ca are fed with high grain rations, P levels in the diet can be greater than Ca levels. This is dangerous and will result in weak bones. Conversely, high Ca levels fed to young growing horses with a Ca:P ratio of greater than 3:1, such as may occur when feeding alfalfa, may also affect bone development.

Legume hays (alfalfa, clover, etc.) have high levels of Ca in relation to P. Calcium can be as much as 15 times higher than phosphorus. Grass hays tend to have lower Ca:P ratios because they contain less Ca in relation to P. To be safe, analyze forages for Ca and P. When you feed alfalfa hay, use a mineral

Table 9. Feeding the Performance Horse (1,100 lbs.) Doing Moderate Work Using Alfalfa Hay.

	DE Mcal	CP - - - - -	Ca grams- -	P - - - - -
Requirement	24.6	982	30.0	21.4
Alfalfa hay[a] (15 lbs)	15.6	1272	93.2	16.3
Additional nut-rients needed	9.0	0	0	5.1
Corn[b] (6 lbs.)	9.2	246	1.3	8.4
Subtotal	24.8	1518	94.5	27.7
Monosodium phosphate (112 g. or 4 oz.)				22.5
Total				47.2

Source: NRC 1989.
[a]Alfalfa hay 1.04 Mcal/lb. DE; 18.7% CP; 1.37% Ca; 0.24%, P
[b]Corn 1.54 Mcal/lb. DE; 9.1% CP; 0.05% Ca; 0.31% P
DE=Digestible energy CP=Crude protein Ca=Calcium P=Phosphorus

Table 10. Feeding the Performance Horse (1,100 lbs.) Doing Moderate Work Using Timothy Hay.

	DE Mcal	CP - - - - -	Ca grams- -	P - - - - -
Requirement	24.6	982	30.0	21.4
Late timothy[a] (15 lbs)	11.25	586	17.0	12.7
Additional nut-rients needed	13.35	396	13.0	8.7
Oats[b] (10.25 lbs.)	13.33	550	3.7	16.0
Subtotal	24.6	1136	20.7	37.4
Limestone (140 g. or 5 oz.)			55.0	
Total			76.0	

Source: NRC 1989.
[a]Timothy hay 0.75 Mcal/lb. DE; 9.6% CP; 0.41% Ca; 0.25%, P
[b]Oats 1.30 Mcal/lb. DE; 11.8% CP; 0.8% Ca; 0.34% P
DE=Digestible energy CP=Crude protein Ca=Calcium P=Phosphorus

Table 11. Mineral Supplements for Horses on Total Pasture or Hay Diets.

Forage	Supplement
Alfalfa	Salt-mineral mix higher in P than Ca (Example: equal parts trace mineral salt, dicalcium phosphate and sodium phosphate.)
Grass	Salt-mineral mix with similar amounts of Ca and P (Example: equal parts trace mineral salt and dicalcium phosphate.)

Source: Rich (personal communication).

supplement low in Ca and high in P (Table 9). In Table 9, monosodium phosphate is used to balance the dietary Ca:P ratio at 2:1. When grass hay is fed, a supplement with high Ca or equal Ca and P will be used depending on the level of Ca in the hay and how much grain is fed (Table 10). Because of the high P supplied by the oats in the example diet in Table 10, a source of Ca is needed. Limestone is used to bring the Ca:P ratio to 2:1. Remember, the diet should be analyzed for Ca and P before making accurate determinations for supplementation.

Trace Minerals

The key to trace mineral supplementation is balance. Some of the required trace minerals include copper, zinc, maganese, iron, and selenium. Unless there is a deficiency, no single trace mineral can be advantageous when fed out of balance with others; it can actually be harmful. Table 11 provides suggested methods of mineral supplementation if free-choice mineral mixes are provided horses on total forage diets. If grain is fed, then provide trace mineral salt. The horse should be fed 2 ozs. of trace mineral salt per day. Free-choice trace mineral salt can be offered to horses; however, they may not consume adequate amounts.

Water and Electrolytes

Always provide good quality water free-choice. The water should be free from mineral or chemical contamination and maintained at about 40°F. The only exception to free-choice is after exercise. Then the horse should be cooled off before being allowed to drink. After prolonged exercise, allow the horse to graze or eat hay 30–90 minutes before full watering. During exercise, the horse should be allowed to drink as frequently as practical.

The electrolytes, which are sodium, magnesium, potassium, chloride, and calcium, are lost in sweat and urine during prolonged physical exertion or when diuretics are administered to horses. However, horses receiving salt and good quality hay should consume adequate electrolytes unless they sweat excessively. Give endurance horses electrolytes and water during and after physical activity. Never add electrolytes to the regular water supply.

Feeding Management

Consistency is critical in feeding horses. Changes in a horse’s feed should be done slowly. Change from a regular feed to a new feed at a rate of 1/2 lb. per day, or 1/4 of the total weight of the feed per day. When placing horses on pasture, turn the horse out for 1 hour the first day and gradually increase the time over a week. Monitor the horse for signs of colic or laminitis. Always feed horses at the same time every day.

Adjusting feeding schedules may improve the performance of intensive activities such as endurance races. For example, withholding grain for 4 hours before a low-intensity endurance activity may help avoid diverting oxygen and fatty acid-rich blood away from the muscles to the digestive tract. Feeding small amounts of hay or grass during the day will help maintain energy levels.

In endurance activities, glycogen stores are depleted in fast twitch muscle fibers. These stores are best replenished by grain diets within 12 hours after the activity. After strenuous work, rest or work the horse lightly for 24–48 hours while muscle glycogen levels are being restored.

Before a horse competes in a high-intensity speed activity such as racing, withhold hay for 8 hours. Feed 3–4 lbs. of grain at least 2–3 hours before the event. The advantage of this feeding schedule is that hay and water weight are reduced and glucose is available for fast energy. After speed work walk the horse to cool it down. Give it hay or grass for 30–90 minutes before full access to water, and then feed it grain.

Health Care Related to Feeding

The grinding motion and wearing down of teeth causes sharp edges on the inside of the bottom and outside of the top jaw. These sharp edges must be filed or floated by your veterinarian so that the horse does not injure itself while chewing its feed. The teeth should be examined at least once a year. Horses are very susceptible to parasitic infection and must be dewormed regularly. A veterinarian can advise you on a deworming program to suit your animal and situation.

Metabolic Problems

Performance horses are prone to colic and laminitis. These problems can be caused by rapid changes in diet, moldy hay, concussion or bruising (road founder), and excessive cold water intake by a hot, inactive horse.

Calcium and electrolyte imbalances in performance horses can result in tetany (muscle spasms or tying up), fatigue, exhaustion, and thumps. Tying up due to electrolyte imbalances occurs after large losses of electrolytes in sweat. These problems occur in endurance racing and should be treated by a veterinarian.

Horses suffering from exertion myopathy (Monday morning disease, azoturia) usually tie up within a few minutes after the activity starts. It can be caused by failure to adjust grain intake to the work schedule. If horses in training are rested for one or more days, reduce the grain by one-half. Other causes may be related to electrolyte imbalances, excitability, and hormonal problems.

Vitamin E and selenium have been used to treat tying-up, but their effectiveness has not been proven. Selenium-deficient forages in Washington make selenium supplementation mandatory in most situations. However, there is a narrow range between the required amount and toxic levels. Consult your veterinarian or county agent for specific recommendations on selenium supplementation. In most situations, select one supplement and feed it according to the label. In addition to balanced nutrition, slow warm-ups, walking and slow trotting lasting 30–45 minutes or longer help prevent tying up. If a horse does tie up, cover it with a blanket and get a veterinarian. Do not try to make the horse walk.

References

Henneke, D.R., G.D. Potter, J.L. Kreider and B.F. Yeats. 1983. Relationship between condition score, physical measurement and body fat percentage in mares. *Equine Veterinary Journal*. 15:371.

Hintz, H.F. 1983. *Horse Nutrition, A Practical Guide*. Prentice Hall Press, New York.

Hintz, H.F. 1988. Weighing horses. *Equine Practice*. 10:8, 10.

Jackson, S.G. 1987. The high performance horse. *Thoroughbred Times*. 3:29, 32.

Lewis, L.D. 1982. *Feeding and Care of the Horse*. Lea and Febinger, Philadelphia.

McMiken, D.F. 1983. An Energetic Basis of Equine Performance. *Equine Veterinary Journal*. 15:2, 123.

Miller, P.A., and L.M. Lawrence. 1986. Changes in equine metabolic characteristics due to exercise fatigue. *Journal of Veterinary Research*. 47 2184.

National Research Council Nutrient Requirements of Horses. 5th Rev. Ed. 1989. National Academy Press, Washington, D.C.

Snow, D.H. 1984. In: *Horse Management*. Ed., J. Hickman. Academic Press, London.

Snow, D.G. and C.J. Vogel. 1987. *Equine Fitness, The Care and Training of the Athletic Horse*. David and Charles, Inc., North Pomfret, Vermont.

Score Description

Condition	Neck	Withers	Loin	Tailhead, Pins & Hooks	Ribs	Shoulder
1 Poor	Bone structure easily noticeable. Animal extremely emaciated; no fatty tissue can be felt.	Bone structure easily noticeable. Animal extremely emaciated; no fatty tissue can be felt.	Prominent spinous processes. Animal extremely emaciated; no fatty tissue can be felt.	Tailhead and hooks and pins project prominently.	Ribs project prominently.	Noticeable bone structure on shoulder.
2 Very Thin	Neck faintly discernable. Animal emaciated.	Withers faintly discernable.	Slight fat covering over base of spinous processes. Transverse processes of lumbar vertebrae feel rounded. Spinous processes are prominent.	Tailhead and hooks and pins are prominent.	Ribs prominent.	Shoulder faintly discernable.
3 Thin	Neck accentuated.	Withers accentuated.	Fat built up about halfway on spinous processes. Transverse processes cannot be felt.	Tailhead prominent, but individual vertebrae cannot be visually identified. Hook bones appear rounded, but easily discernable. Spinous processes easily discernable. Pin bones not distinguishable.	Slight fat cover over ribs. Ribs easily discernable.	Shoulder accentuated.
4 Moderately Thin	Neck not obviously thin.	Withers not obviously thin.	Spinous process (ridge) along back.	Tailhead prominence depends on conformation, fat can be felt around it. Hook bones not discernable.	Faint outline of ribs discernable.	Shoulder not obviously thin.
5 Moderate	Neck blends smoothly into body.	Withers appear rounded over spinous processes.	Back is level.	Fat around tailhead beginning to feel spongy.	Ribs cannot be visually distinguished, but can be easily felt.	Shoulder blends smoothly into body.
6 Moderate to Fleshy	Fat beginning to be deposited.	Fat beginning to be deposited.	May have slight crease down back.	Fat around tailhead feels soft.	Fat over ribs feels spongy.	Fat beginning to be deposited.
7 Fleshy	Fat deposited along neck.	Fat deposited along withers.	May have crease down back.	Fat around tailhead is soft.	Individual ribs can be felt, but noticeable filling between ribs with fat.	Fat deposited behind shoulders.
8 Fat	Noticeable thickening of neck. Fat deposited along inner buttocks.	Area along withers filled with fat. Fat deposited along inner buttocks.	Crease down back.	Fat around tailhead very soft.	Difficult to palpate ribs.	Area behind shoulder filled in flush.
9 Extremely Fat	Bulging Fat. Fat along inner buttocks may rub together. Flank filled in flush.	Bulging Fat. Fat along inner buttocks may rub together. Flank filled in flush.	Obvious crease down back. Fat along inner buttocks may rub together. Flank filled in flush.	Bulging fat around tailhead.	Patchy fat appearing over ribs.	Bulging fat.

Source: Henneke et al. 1983.

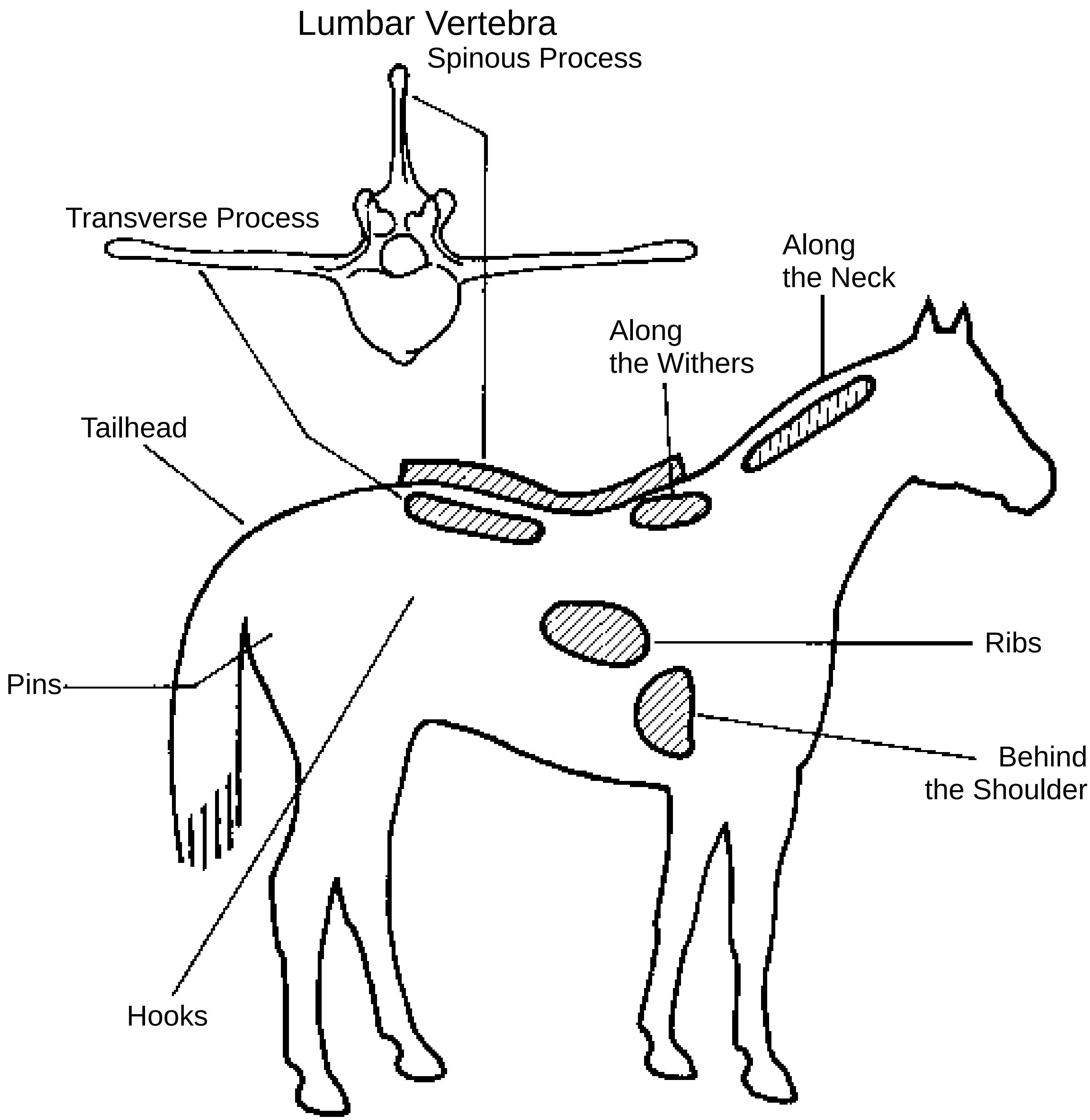

Figure 1. Condition Score System

Larry A. Lawrence, former Extension Equine Specialist at Washington State University.

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