

## Feeding Working and Performance Horses

The horse is an incredible athlete, excelling at both maximal sprinting, such as racing or rodeo events, and low-intensity, long duration activities, such as a 160-km endurance ride.

Whether your horses are competing at top levels or just being used for the occasional trail ride, they must be fed adequately to ensure optimal health and performance.

### Exercise increases nutrient needs

All horses need the major nutrients:

- energy
- protein
- minerals
- vitamins
- water

By far, the most important nutrient affected by exercise is *energy*, or the calorie content of the diet. Muscles require energy to contract. The harder or longer the horse is working, the more calories the muscles are burning, and therefore, the more energy is needed in the diet.

The fuels used by muscles during exercise ultimately originate from the diet; therefore, the energy content of the diet must increase to meet these needs. Muscles rely primarily on stored carbohydrates (blood glucose and muscle glycogen) and fats (stored under the skin or in muscle) to fuel contraction during exercise.

Protein can also be used as an energy source, but it is very inefficient and doesn't contribute greatly as a fuel for muscle contraction. Therefore, while dietary protein needs increase with an increased level of activity, the

additional feed intake required to supply the necessary energy will usually supply the additional protein needed.

Exercising horses also need slightly higher levels of vitamins and minerals in their diet. Special attention should be paid to meeting the calcium and phosphorus needs of young horses just beginning training because they are still growing. In addition, hays and grains grown in Alberta are low in the trace minerals zinc, copper and manganese and will likely need to be supplemented in the diets of all horses. And, depending on the area, selenium may be deficient in feeds.

*Working horses must be fed adequately to ensure optimal health and performance*

Feeding high quality feeds will provide the majority of the vitamins and minerals needed by active horses, especially if using a commercial grain mix that has these nutrients added. When feeding plain grains, such as whole oats, vitamins and minerals can be added by including a 1:1 livestock mineral or other suitable vitamin/mineral supplement.

Be careful not to over-supplement vitamins and minerals. Excess vitamins and minerals are not only a waste of money, but they may also create problems by upsetting the balance of other nutrients in the diet or by causing toxicity.

An adequate source of salt is critical to working horses because horses lose salt in sweat during exercise. For horses performing light work, free access to a salt block works well. Horses performing moderate to heavy work may need to have additional loose salt top-dressed on their grain ration.

In cool to moderate temperatures, the horse will need at least 2 to 3 oz (56 to 85 g) of salt per day. In the warmer summer months, 4 to 6 oz (112 to 170 g) of salt per day, or more, may be needed to replace heavier sweat losses.

<b>Table 1. Minimum nutrient concentrations needed in diets of working horses <sup>a</sup></b>				
<b>Horse</b>	<b>Energy Mcal/lb (Mcal/kg)</b>	<b>Protein %</b>	<b>Calcium %</b>	<b>Phosphorus %</b>
<b>Mature Horses</b>				
Idle	0.90 (2.00)	8	0.25	0.17
Light work <sup>b</sup>	1.15 (2.45)	10	0.30	0.22
Moderate work <sup>c</sup>	1.20 (2.65)	10.5	0.31	0.23
Intense work <sup>d</sup>	1.30 (2.85)	11.5	0.35	0.25
<b>Young horses in training</b>				
Long yearling	1.20 (2.65)	12	0.36	0.20
2-year-old	1.20 (2.65)	11.5	0.33	0.20

<sup>a</sup> Values are presented on a 100% dry matter basis; table values are the concentrations needed in the **total** diet.

<sup>b</sup> Light work = pleasure riding, trail riding, equitation (practice of horsemanship).

<sup>c</sup> Moderate work = roping, cutting, reining, jumping.

<sup>d</sup> Intense work = race training, eventing, polo, endurance.

The minimum nutrient concentrations needed by mature working horses and young horses entering training are presented in Table 1. The concentrations of nutrients needed are shown as a percentage of the *total* diet.

## Feeds for the active horse

When designing your feeding program, remember that **good quality forages should form the basis of the ration for ALL horses**. Good quality forage in the form of hay or pasture provides energy, protein, vitamins and minerals. With good quality forages, less supplementation is needed to complete the diet.

Alfalfa hays are usually higher in digestible energy, protein and calcium than grass hays, such as brome, timothy or orchard grass (Table 2). The protein and energy contents of mixed alfalfa/grass hays are usually intermediate between plain alfalfa and grass hays.

The nutrient content of hays is strongly influenced by the stage of growth at which it was cut. As growing forage matures in the field, protein and energy content may decrease by more than 40 per cent. To optimize the nutritional quality of hays fed to horses, grasses should be cut before the head goes to seed, and alfalfa should be cut at first flower.

<b>Table 2. Average nutrient composition of feeds grown in Alberta *</b>					
	<b>Digestible Energy Mcal/lb (Mcal/kg)</b>	<b>Protein %</b>	<b>Fibre (ADF) %</b>	<b>Calcium %</b>	<b>Phosphorus %</b>
Alfalfa hay	1.11 (2.45)	18.1	31.9	1.76	0.22
Mix alfalfa/grass hay	1.09 (2.39)	14.8	30.7	1.58	0.18
Grass hay Timothy, Orchard grass, Brome, Prairie wool, etc.	0.88 (1.93)	8.5	38.0	0.48	0.14
Oats	1.60 (3.53)	11.5	14.0	0.09	0.35
Barley	1.69 (3.73)	12.3	7.0	0.07	0.38
Corn	1.75 (3.84)	10.4	4.1	0.05	0.31
Oil	4.09 (9.00)	–	–	–	–

\* Values are presented on a 100% dry matter basis.

Depending on the level of activity, many horses will be unable to consume enough feed to meet their energy needs from forage alone. Grains contain 25 to 75 per cent more energy per pound (or kg) than hays.

While most grains contain a relatively similar protein content, they differ greatly in their energy content. By weight, corn contains 15 per cent more energy and barley contains 10 per cent more energy than oats (Table 2). Therefore, a smaller volume of corn or barley would be fed compared to oats. This situation illustrates why it is important to feed by weight, rather than by volume.

Commercial grain mixes offer convenience by incorporating additional vitamins and minerals into the grain mix to create a balanced ration. When commercial grain mixes are used, they should be selected to complement the forage being fed. For mature working horses, a 10 per cent protein grain mix should be used with alfalfa hay. A 12 per cent protein mix works well with mixed grass/alfalfa hays and good quality (early- to mid-maturity) grass hays. Feeding a mature, late-bloom grass hay requires a 14 per cent protein grain mix to meet the requirements of working horses.

A dietary fat source, such as corn oil or canola oil, can also be fed to increase the energy density of the diet. Vegetable oils contain almost three times the energy of oats (Table 2). In other words, one cup of oil has the same number of calories as about 1.5 pounds (0.7 kg) of oats.

For horses receiving large quantities of grain (5 pounds (2.2 kg) or more), substituting a portion of the grain ration with oil also has the benefit of reducing the amount of starch in the diet. Too much starch from grains can overload the horse's hindgut, increasing the risk of colic or laminitis. For most adult light-breed horses, 2 cups of oil per day is the maximum amount that should be included in the diet.

## Feeding horses in light work

Horses ridden for pleasure or trail riding three to five times a week are considered to be horses in "light" work. You can often meet the additional nutrient requirements of horses in light work by simply increasing the amount of good quality hay you feed, without adding grain to the diet (Table 3). Alternatively, some horses may do better with a small amount of grain added to the diet (Table 3).

**Table 3. Examples of feeding programs for 1,100 lb (500 kg) horses in light work<sup>a</sup>**

Feed	Ration 1	Ration 2	Ration 3
Alfalfa/grass hay	20 lbs (9 kg)	14 lbs (6.5 kg)	–
Grass hay	–	–	16 lbs (7.25 kg)
Oats	–	3 - 4 lbs (1.75 kg)	–
12 % grain mix <sup>b</sup>	–	–	3 - 4 lbs (1.75 kg)
18:18 mineral <sup>c</sup>	1 oz (28 g)	1 oz (28 g)	1 oz (28 g)
TM salt <sup>d</sup>	free choice	free choice	free choice

<sup>a</sup> Light work = pleasure riding, trail riding, equitation.

<sup>b</sup> Commercial grain mix with 12% protein; although most commercial grain mixes are fortified with minerals and vitamins, you may need to supplement additional vitamins and minerals (the livestock mineral in this example) if you do not feed the minimum recommended levels of the commercial grain mix (typically 5 lbs (2.2 kg) or more per day).

<sup>c</sup> 1:1 livestock mineral (18% calcium, 18% phosphorus).

<sup>d</sup> Trace-mineralized salt (with iodine).

## Feeding horses in moderate work

"Moderate" work includes barrel racing, ranch work, team penning, cutting and jumping, amongst other activities. Some horses in moderate work may be able to maintain good body condition with hay alone, while others may not be capable of eating the large amounts of hay needed to meet their increased energy requirements (Table 4). For most horses in moderate work, grain will have to be added to the diet to provide adequate levels of energy (Table 4).

## Feeding horses in intense work

Horses competing in Quarter horse, Thoroughbred or Standardbred racing, endurance riding, or polo are performing "intense" work. These hard-working horses usually require large amounts of grain to meet increased energy needs (Table 5).

A dietary fat source should be considered for horses in intense work. Substituting some of the grain with a vegetable oil (corn, canola, soy, etc.) can reduce the amount of grain required, thereby decreasing the risk of colic and laminitis associated with high-grain diets.

**Table 4. Examples of feeding programs for 1,100 lb (500 kg) horses in moderate work <sup>a</sup>**

Feed	Ration 1	Ration 2	Ration 3
Alfalfa/grass hay	25 lbs (11 kg)	15 - 17 lbs (7 - 8 kg)	–
Grass hay	–	–	18 lbs (8.25 kg)
Oats	–	5 - 7 lbs (2 - 3 kg)	–
12 % grain mix <sup>b</sup>	–	–	5 - 7 lbs (2 - 3 kg)
18:18 mineral <sup>c</sup>	1 oz (28 g)	1 oz (28 g)	–
TM salt <sup>d</sup>	free choice	free choice	free choice

<sup>a</sup> Moderate work = roping, cutting, reining, jumping.

<sup>b</sup> Commercial grain mix with 12% protein; most commercial grain mixes are fortified with minerals and vitamins. If you feed the minimum recommended levels of the commercial grain mix (typically 5 lbs (2.2 kg) or more per day), you will not need to supplement additional vitamins and minerals.

<sup>c</sup> 1:1 livestock mineral (18% calcium, 18% phosphorus).

<sup>d</sup> Trace-mineralized salt (with iodine).

**Table 5. Examples of feeding programs for 1,100 lb (500 kg) horses in intense work <sup>a</sup>**

Feed	Ration 1	Ration 2	Ration 3
Alfalfa/grass hay	15 - 17 lbs (7 - 8 kg)	–	–
Grass hay	–	17 - 19 lbs (8 - 9 kg)	17 - 19 lbs (8 - 9 kg)
Oats	10 - 11 lbs (5 kg)	–	–
12 % grain mix <sup>b</sup>	–	10 - 11 lbs (5 kg)	8.5 - 9.5 lbs (4.5 kg)
Oil (corn, canola, soy, etc.)	–	–	1 cup <sup>e</sup>
18:18 mineral <sup>c</sup>	1 oz (28 g)	1 oz (28 g)	–
TM salt <sup>d</sup>	free choice	free choice	free choice

<sup>a</sup> Intense work = race training, eventing, polo, endurance.

<sup>b</sup> Commercial grain mix with 12% protein; most commercial grain mixes are fortified with minerals and vitamins. If you feed the minimum recommended levels of the commercial grain mix (typically 5 lbs (2.2 kg) or more per day), you will not need to supplement additional vitamins and minerals.

<sup>c</sup> 1:1 livestock mineral (18% calcium, 18% phosphorus).

<sup>d</sup> Trace-mineralized salt (with iodine).

<sup>e</sup> Oil can be used to substitute some of the grain (1 cup oil = 1.5 lbs (0.7 kg) oats); maximum amount of oil that can be fed to most adult light-breeds of horses is 2 cups.

## When to feed before riding

Feeding management is also important for active horses because *what* and *when* you feed can influence performance.

The best time to feed a full meal of grain before riding is at least 4 hours before exercise (Table 6). Blood glucose and insulin increase when the horse eats grain. Horses that begin exercise with elevated insulin may fatigue quicker, because insulin prevents muscles from making the best use of nutrients needed to fuel muscle contraction. Allowing at least 4 hours between a grain meal and exercise will allow blood glucose and insulin to come back to baseline, leaving muscles to work optimally.

**Table 6. When to feed before riding**

Type of activity	When to feed HAY	When to feed GRAIN
High intensity <sup>a</sup>	Remove hay 4 hours before competition.	Feed grain 4 or more hours before competition.
Light to moderate intensity <sup>b</sup>	Remove hay 4 hours before riding.  Or, adapt horse to eating smaller meals throughout the day.  Or, allow horse access to pasture.	Feed grain 4 or more hours before riding.
Long distance <sup>c</sup>	Allow free access to hay right up until competition.  Allow access to hay during the ride.	Feed large grain meals no closer than 4 hours before the ride.  Feed smaller amounts of grain throughout the ride.

<sup>a</sup> High intensity activity = Thoroughbred, Standardbred and Quarter Horse racing; barrel racing, roping, cutting, etc.

<sup>b</sup> Light to moderate intensity = pleasure/trail riding, jumping, team penning, reining, etc.

<sup>c</sup> Long distance activity = endurance riding, competitive trail riding, pack trips, etc.

For horses that will be exerting themselves heavily, hay should also be removed 4 hours before exercise (Table 6). Ingestion of hay increases “gut fill,” which increases the amount of weight the horse has to carry. This additional weight (20 to 40 pounds or 9 to 18 kg) could be a handicap for horses competing in high-speed events.

Hay feeding also temporarily reduces the volume of blood circulating to the tissues. This situation means less blood is available to fuel muscle contraction, and less blood is directed towards the skin to remove excess heat. As a result, horses may get muscle cramps or overheated if they are exercised after a large meal of hay.

A digestive tract full of hay also demands a certain amount of blood flow to aid in digestion. Blood diverted away from a full digestive tract and towards working muscles may put the horse at risk for colic.

Hay will not affect gut fill and blood flow if the horse is fed smaller meals (2 to 4 pounds or 1 to 2 kg) of hay in the 4-hour period before exercise rather than a large meal (6 to 10 pounds or 3 to 5 kg), or if the horse is used to grazing pasture throughout the day.

Exceptions to the above feeding management recommendations involve horses participating in long distance events (endurance riding, competitive trail riding, pack trips, etc.). These horses should have access to hay right up until the event, to promote water consumption and to enhance the fluid reserve in the horse's hind gut (Table 6). In addition, these horses should be given small amounts of grain (0.5 to 1.0 pounds or 225 to 450 g) throughout the ride to maintain adequate energy levels (Table 6). If the horse consumes this grain and is back on the trail within an hour, elevated blood glucose and insulin levels, and the resulting impact on muscle function, will be avoided.

## General feeding guidelines

In summary, here are a few things to remember when designing a feeding program for performance horses:

1. Good quality forage is the basis for all feeding programs:
  - All horses, no matter what their use, require a minimum of 1 per cent of their body weight in forage per day to maintain healthy gut function.
  - Forage can be provided in the form of hay, pasture or some other high-fibre feed source.
  - Selection of all other feeds and grain supplements should be made based on the forage included in your horse's diet.
  - While forage may provide all the nutrition needed by horses in light work, horses in moderate or intense work will likely need supplementation with more energy-dense feeds like grains and oils.

2. To reduce the risk of colic and founder:
  - Changes to the diet should be made gradually over one to two weeks.
  - Never feed more than 5 pounds (2.2 kg) of grain at a single feeding.
  - Feed smaller meals more frequently.
3. The amount fed should be varied as needed:
  - Your horse's body weight and condition are the best indicators of the amount of feed needed.
  - Most performance horses should have a body condition score of 5 to 7 (1 to 9 scale: 1 = thin, 5 = moderate, 9 = obese). Thin horses may not have enough energy stores to sustain the activity required of them. Similarly, extra fat carried around by overweight horses puts added stress on joints, tendons and ligaments.
  - For more information on body condition scoring, see the Alberta Agriculture factsheet *Body Condition Scoring Your Horse* (Agdex 460/20-1).
4. Provide "free-choice" access to salt
5. Provide an easily accessible, clean source of water at all times.

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