

Equine Nutrition 101

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Nutrition Requirements for Horses

There are five basic things that a horse requires and that a horse owner will need to supply as part of a horse's diet:

- Water
- Energy (carbohydrate + fat)
- Protein
- Vitamins
- Minerals



Basic Nutrients - Water

- Water is the single most important thing in a horse's diet. A loss of 10% of the body's water in a horse is devastating to a horse's health. Water acts as a coolant, helps with many of the chemical reactions in a horse's body and is critical for maintaining blood pressure.
- A horse's water requirement can more than double during exercise in hot/humid weather. Failure to provide continuous access to water is a prime cause of colic.

Rule: always offer good clean water, free choice and when possible have the water temperature between 7 – 24 degrees Celsius to ensure optimum water consumption.

Basic Nutrients - Quiz 1

Why is water so important in a horse's diet?

- Water acts as a coolant True False
- Acts to maintain blood pressure True False
- Helps in many chemical reactions True False



Basic Nutrients - Quiz 1 Answers

All True!

Water acts as a coolant, helps with many of the chemical reactions in a horse's body and is critical for maintaining blood pressure.

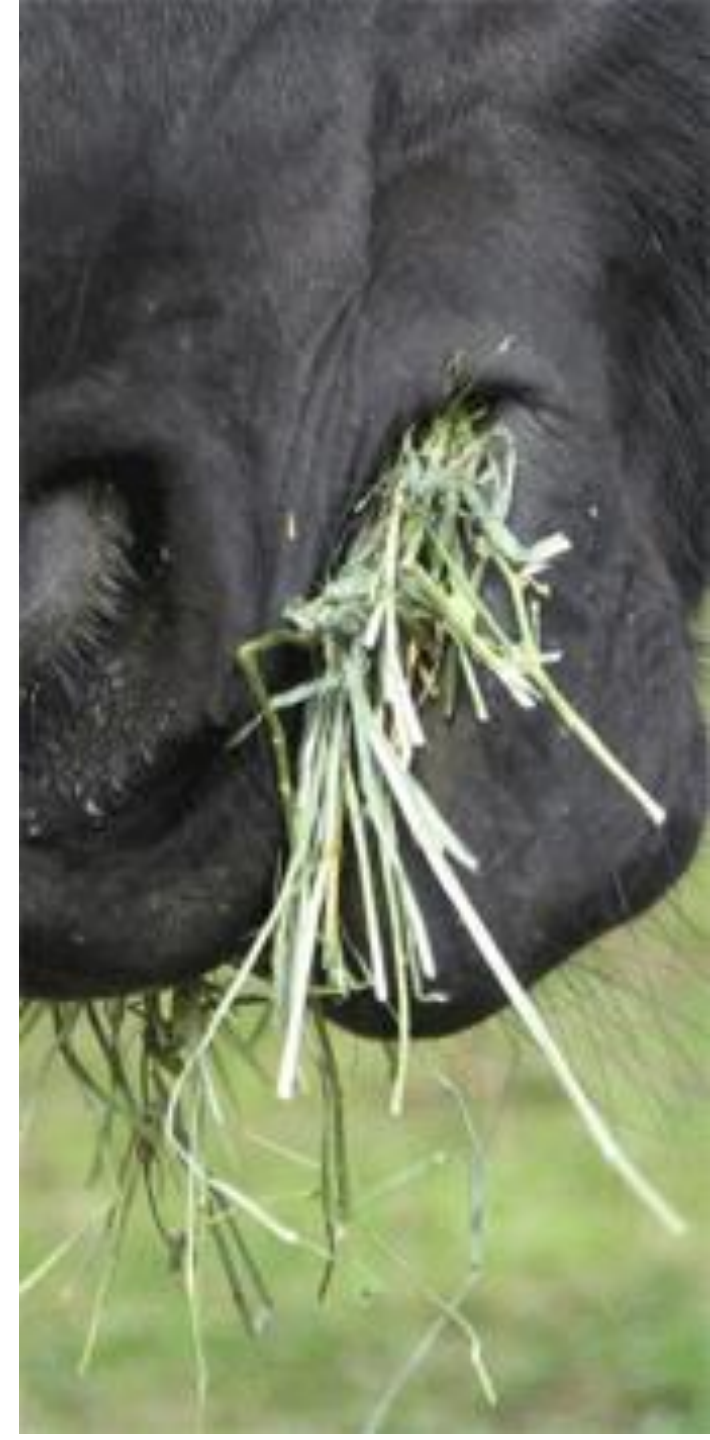
Basic Nutrients - Energy

- Energy is the fuel that allows the heart to beat, muscles to work, foals to grow inside pregnant mares, mares to produce milk and stimulates growth in young horses.
- Energy is not a nutrient however a horse gets energy from the digestion of carbohydrates, fats and proteins that are contained in the feeds that they eat.
- Energy is one of the main focuses of any horse's diet because we can visually see when we are feeding too much or too little by the condition of the horse. If horses are fed too much energy, they will gain weight, while horses that are not fed enough energy will loose body weight.
- Approximately 80-90% of the feed that a horse eats is used to meet its energy requirement.

Basic Nutrients - Carbohydrates

The following are the main sources of energy in a horse's diet:

- ***Carbohydrates*** are one of the primary sources of energy for any horse because approximately 75% of the plant material that a horse eats is made up of carbohydrates. Carbohydrates are broken into two basic groups structural and nonstructural.
 - ✓ *Structural carbohydrates* come from plant fiber (forages,) bacteria in the intestines digest only about 50% and the remainder is passed out in the manure. Horses require a minimum of 1% of body weight in forage.
 - ✓ *Nonstructural carbohydrates* come primarily from the grains that we feed. They are in the form of starches, sugars and pectin. The most important nonstructural carbohydrate is starch and is a highly digestible energy source that is provided in grains like oats, corn & barley. Remember horses are limited to the amounts of nonstructural carbohydrates that they can handle.



Basic Nutrients - Fats and Proteins

- ✓ **Fats** are an excellent source of energy for horses and highly digestible. In fact fat sources provide two to three times more digestible energy than similar quantities of grains. Fat sources come in both liquid (vegetable oils) and solid (rice bran & dry fat). Both will work well, solids are a little easier to feed.
- ✓ **Protein** can also be a source of energy in a horse's diet but only when we feed more than the horse's daily protein requirement. Protein is not a very effective source of energy due to the high cost of protein ingredients like alfalfa and soyabean meal etc. Horses that are fed inadequate energy will use feed protein and body protein (muscle) to meet their energy needs. Don't short change your horse the energy it requires.

Basic Nutrients - Protein

The following is a guideline for total protein requirements:

Mature Horses	8-12%
Pregnant Mares	10-12%
Lactating Mares	13-14% (extra protein needed for milk production)
Weanlings	14-16% (high protein required for growth tissue and lower consumption levels than mature horses)
Yearlings	13-14%

Basic Nutrients - Protein

3. Proteins

- Proteins are made up of amino acids that are the building blocks of hair, hoof, skin, muscles and blood cells. If your horse suffers from hoof, skin or coat problems it may be caused by a lack of protein in the diet.
- Quality of protein can contribute to a lack of protein. So before you purchase a fancy supplement to fix the problem, balance the protein in your horse's diet.
- Horses that receive adequate protein in their diets are able to obtain all the essential and nonessential amino acids that they require from the feed and will help them digest fibre and turn it into energy. Protein needs for horses will vary depending on age and activity level of each horse.

Basic Nutrients - Protein

- Studies have shown that feeding modest excesses of protein isn't really harmful to a horse's health and will not cause a horse to have large swings in energy however it may be a waste of money. Excess protein is passed in the horse's urine. Large excesses of protein may cause metabolic and digestive problems that can include large amounts of ammonia in the urine and when left untreated in confined spaces this can cause respiratory problems.
- It is important to remember that the protein level in a feed does not equal energy as factors such as the quality of the forage and quality of the protein sources will all impact the daily protein needs of a horse. A horse will derive most of its energy from carbohydrates and fats and not from the protein in its diet.



Basic Nutrients - Quiz #2

1. What are the sources of energy for a horse?
2. What are the two basic groups of carbohydrates?
3. Name the sources of each type of carbohydrate?

Basic Nutrients - Quiz #2 Answer

1. Energy is produced from the digestion of carbohydrates, fats, and proteins contained in the feeds that horses eat.
2. The two basic types of carbohydrates are structural found in plant fiber and nonstructural
3. Carbohydrates found in primarily grains.



Basic Nutrients - Vitamins

- Vitamins are needed for all normal metabolic functions in a horse's body and are divided into two classes, fat-soluble and water-soluble.
- Horses are able to obtain most of the vitamins that they require from their diet, their own body stores and from the bacteria that synthesize B-complex vitamins in the digestive tract.
 - Exceptions would be horses under stress, brood mares, performance horses, young growing horses and senior horses all may require supplemental vitamins.
- Feeding a well fortified manufactured feed formulated in B.C. should fill in any vitamin gaps that exist in a horse diet. Remember to follow the manufacturer's feeding guidelines.

Basic Nutrients - Fat-Soluble Vitamins

Fat-soluble vitamins include vitamins A, D and E. These are stored in the fat reserves of a horse's body. Green pasture is rich in fat-soluble vitamins but forage that has been stored for some time will rapidly lose these vitamins.

Vitamin A helps maintain health in cells that relate to skin, eyes and digestive tract as well as reproductive and immune systems as well as normal vision.

- Green forage is an excellent source of vitamin A but additional supplementation is usually required. Generally deficient in unfortified feeds and usually needs to be supplemented through fortified feeds and or complete supplements.

Vitamin D helps with growth and bone development. Very rare to have a deficiency in horses as they produce their own vitamin D when exposed to sunlight. Stabled horses and horses during the winter when sunlight exposure is low can benefit from added Vitamin D.

Vitamin E is very important for immune, nervous system and muscle functions, reproduction, muscle development, red blood cells and other chemical functions in a horse's body.

- Vitamin E is an antioxidant and is rapidly lost from stored forages and processed grains like COB. Recent studies have shown that supplementation is essential for all horses.



Basic Nutrients - Water Soluble Vitamins

Water-soluble vitamins like vitamin C and B-complex vitamins can not be stored for long periods of time because of the lack of a place to store them in a horse's body.

B-Complex vitamins are generally not deficient in horses as they are produced in large amounts by bacteria in the large intestine. Freshness of forages and fortified feeds is critical to prevent oxidation of vitamins.

- High quality fortified horse feeds are supplemented with B-complex vitamins including biotin to ensure horses that may be getting marginal or reduced forage get enough to meet their requirements.

Vitamin C - No deficiencies or toxicities have been reported in horses because they can manufacture what they require.

Basic Nutrients - Quiz #3

1. Vitamins are divided into two classes, what are these classes?
2. What are some examples of the vitamins in each vitamin class?



Basic Nutrients - Quiz #3 Answers

1. Vitamins are divided into two classes, what are these classes?

Fat Soluble and Water Soluble

2. What are some examples of the vitamins in each vitamin class?

Fat : Vitamin A, D and E

Water: Vitamin B Complex and Vitamin C

Basic Nutrients - Minerals (Ash)

Minerals (Ash) are inorganic and unlike vitamins cannot be produced by a horse and so need to be provided in a horse's diet.

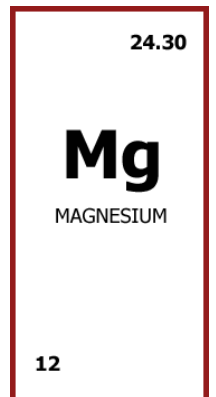
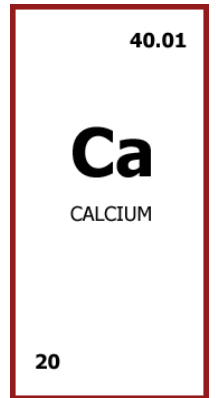
- Levels of minerals vary in forages and unfortified grains depending on the soil where they were grown.
- It is important to remember that over fortification of minerals can be worse than too little. Correct fortification is essential! So buy feeds that are formulated and manufactured for your region and don't dilute them with unfortified grains.



Basic Nutrients - Macro Minerals

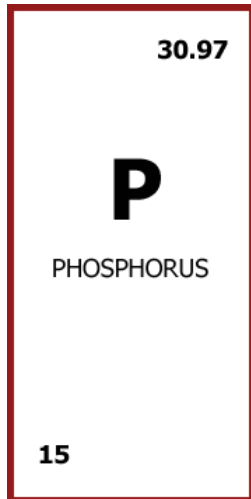
Macro Minerals (needed in a diet in larger quantities) and include the following important minerals:

- **Calcium** is required for development of bone and for muscle and nerve functions as well as blood clotting.
 - Although maintaining an optimum Calcium : Phosphorous balance of 2 parts calcium to 1 part phosphorus (2 : 1) is important a range up to a 3 : 1 or more would not be harmful, more important is meeting the minimum calcium requirement level for the age and activity level of your horse. Many of the forages produced in B.C. are deficient in calcium.
- **Magnesium** is added to feeds and is required by enzyme functions that are critical for the production of energy.
 - Magnesium is another mineral that is generally found to be deficient in B.C. forages. Excess calcium can interfere with magnesium utilization.



Basic Nutrients - Macro Minerals

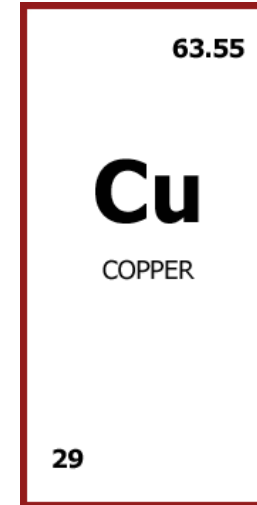
- **Phosphorous** is required for the development of the skeleton and for other metabolic functions. Levels of phosphorous are closely related to the availability of calcium to a horse. Extremely high levels of phosphorous in a diet can tie up the calcium making it unavailable to the horse.
- Fortified feeds have been formulated to balance the calcium and phosphorous levels. Some common feed stuffs that are fed that are high in phosphorous and cause Ca:P imbalances are wheat bran, unbalanced rice bran and most grains. As an example C.O.B. (corn, oats, and barley) has not been balanced and contains high levels of phosphorous and if fed needs to be balanced using a supplemental product. Vitamin D is a vitamin that helps horses to use the calcium and phosphorous in their diets.



Basic Nutrients - Micro Minerals

Micro Minerals are needed in a diet in very small quantities. Included are the following minerals sometimes known as trace minerals:

- **Copper** is a mineral that is involved in blood and bone production and skin pigmentation. Copper is related to the absorption of iron, zinc and other trace minerals.
 - Recent studies have shown that feeds that contain supplemental copper levels when fed to pregnant mares have shown a reduction of OCD (osteocondrosis) in the foals.
 - Copper also helps red blood cells carry adequate oxygen.



Basic Nutrients - Micro Minerals

65.41

Zn

ZINC

30

Iron is very important for transport of oxygen by the red blood cells. Deficiencies are not common but too much iron can cause other minerals not to be absorbed by the body.

55.85

Fe

IRON

26

Zinc is important for skeletal development, reproduction and also the strengthening of the immune system. Horses that are fed only forages may have marginal levels of zinc. Zinc is a very important mineral for foals and young growing horses.



Basic Nutrients - Micro Minerals

Selenium is associated with normal immune and muscle functions. Selenium is generally deficient in British Columbia therefore fortified feeds and supplements formulated and produced in B.C. are generally fortified with adequate levels to compensate for lack in the forage.

Caution: Many areas of North America do not have selenium deficiencies and so feeds and supplements that are formulated and produced elsewhere may not have adequate levels.

Also be aware that feeding supplemental selenium on top of feed that contains selenium, salt with selenium and vitamin / mineral supplements with selenium may result in a toxicity problem.

Proper Vitamin E levels in a diet along with selenium work together to prevent immune and muscle problems.

78.96
Se
SELENIUM
34

Basic Nutrients - Quiz #4

Minerals are important in horse's diet and must be provided in feeds, as a horse does not produce minerals.

What are the two important classifications of minerals?



Basic Nutrients - Quiz #4 Answers

Macro minerals are needed in large quantities in the diet and micro or trace minerals are needed in much smaller quantities.

Basic Nutrients - Electrolytes

Electrolytes are macro minerals that will conduct electricity when dissolved in water. These have great effect on normal function of muscles and nerves helping the electrical activity that is occurring in a horse.

- **Salt** when offered free choice daily along with a good supply of water will ensure that the average horse is getting enough electrolytes in its diet. Loose salt works better for horses than blocks to increase the intake level.
- **Potassium** is usually higher in forages than grains and so it is important to feed enough forage.

Basic Nutrients - Electrolytes

Calcium see above information on calcium levels. Supplemental electrolytes are not normally required as horses will get most of the salt and potassium they need from diets.

- Horses that have access to free choice loose salt on a daily basis will usually consume enough to meet their needs.
- Only under extreme exercise during hot humid weather may some horses require electrolytes to be supplemented. Example would be some endurance horses.



Basic Nutrients - Quiz #5

Are electrolytes macro minerals that conduct electricity when dissolved in water?

True

False

Basic Nutrients - Quiz #5 Answers

Are electrolytes macro
minerals that conduct
electricity when dissolved in
water?

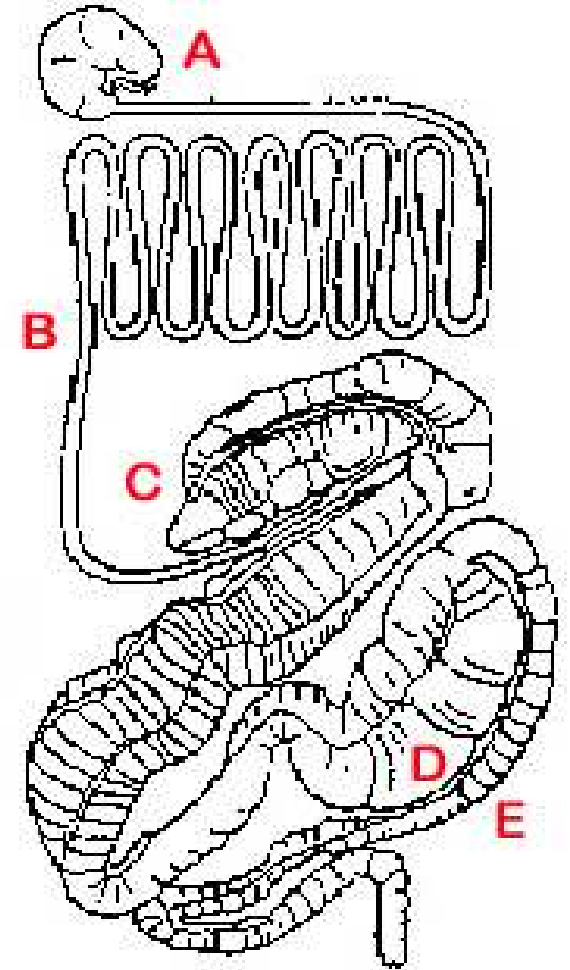
True



The Digestive System

The digestive system of a mature horse is over 100 ft long and is made up of 5 key sections.

- A** - Stomach
- B** - Small Intestine (70ft)
- C** - Cecum (4ft)
- D** - Large Colon(10-12ft)
- E** - Small Colon(10-12ft)



The Digestive System

Horses are excellent fibre digesters. They have a very large hind gut for digestion of fibre, and fibre is required for horses to maintain optimum digestive system health.

Horses require a minimum of 1% of their body weight in forage with 1.5 - 2% being normal for a mature horse.

When a horse is fed forage and grain it takes about 2 hours to reach the cecum and yet takes as long as 70 hours to pass through the rest of the digestive system.

If too much concentrated feed is fed at one time it can overpower the small intestine and will pass right through to the large intestine where it will ferment and produce gas and harmful byproducts that can cause colic or laminitis.

The Digestive System

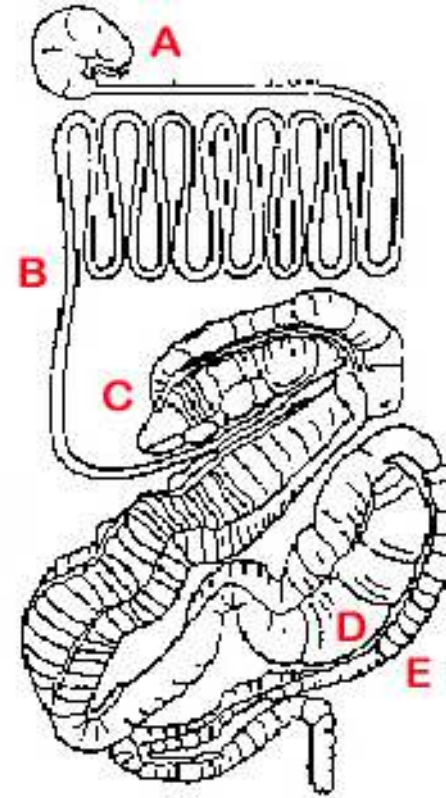
1. To help prevent digestive system upsets that may cause colic follow these few simple rules:
2. Feed grain to horses in two or more feedings, increase feedings when higher grain levels are used. Never feed more than 2.2 kg of grain at any 1 feeding.
3. Avoid sudden feed changes. Studies show two or more changes in hay or one or more changes in grain per year will increase the chance that horses will colic. Allow 2 weeks for a gradual change to any new hay or grain added to the diet.
4. Keep a regular feeding schedule.
5. Avoid coarse / poor quality hay that may cause impactions or that may contain molds. Usually a good quality grass hay or grass and legume mix will work very well for horses.
6. Avoid decreases in water intake by making sure drinkable water is available at all times. Will help to prevent colic.
7. Regular exercise schedule will help a horse's general health.

Remember colic can be prevented.



The Digestive System - Quiz #6

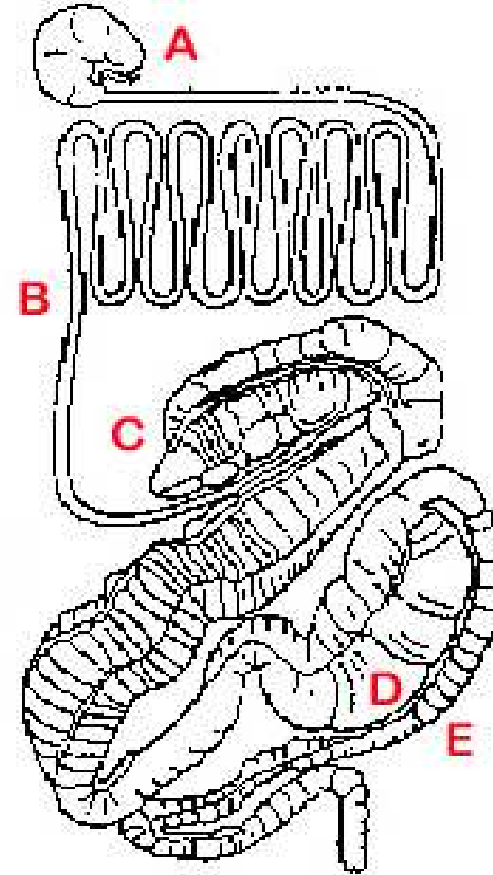
Name the five parts of a horse's digestive tract



The Digestive System - Quiz #6 Answers

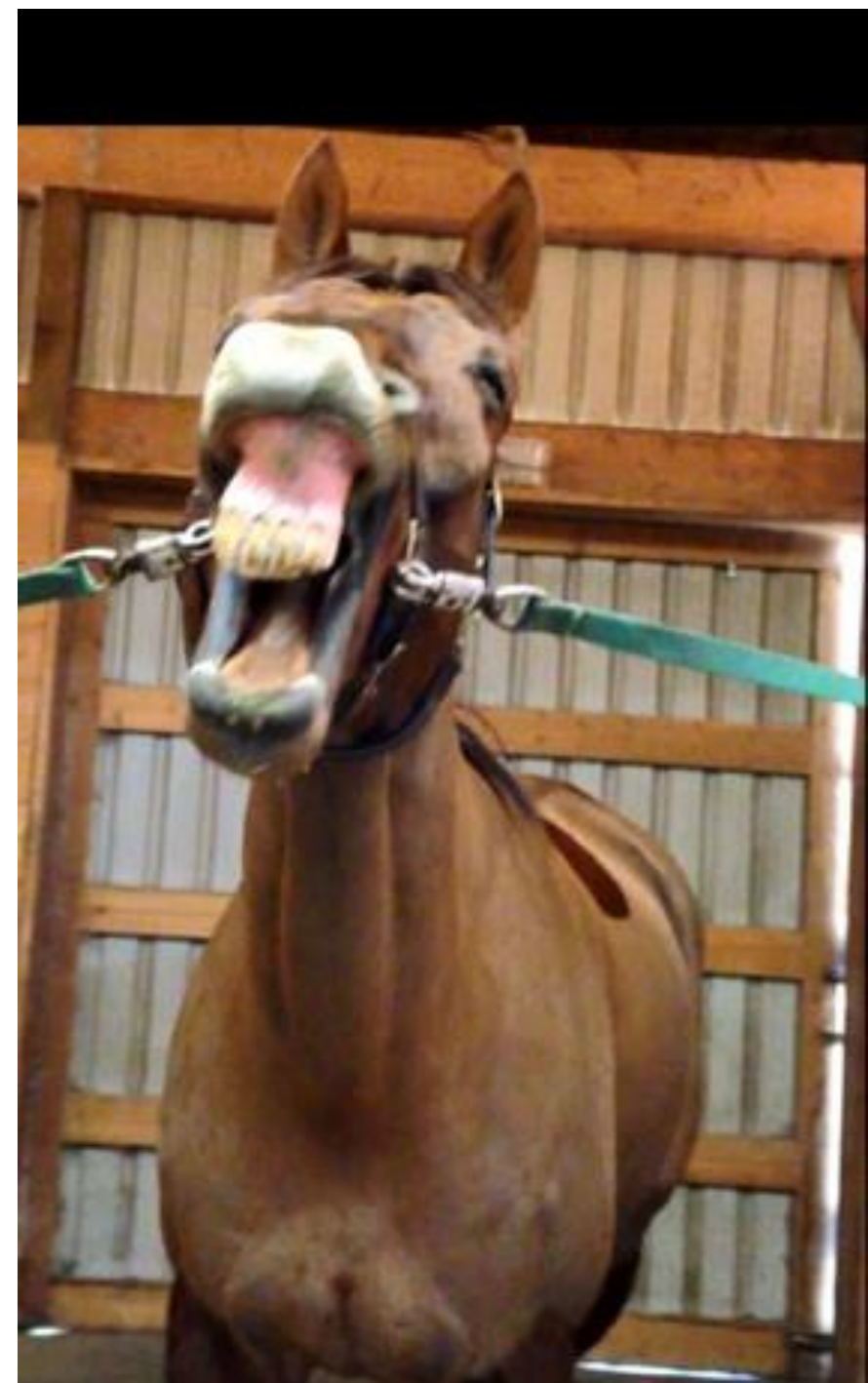
The five parts of a horse's digestive tract are:

- A** Stomach
- B** Small Intestine
- C** Cecum
- D** Large Colon
- E** Small Colon



The Digestive System - Quiz #7

Why is it important to avoid sudden feed changes?



The Digestive System- Quiz #7 Answers

Sudden feed changes may increase the risk of colic.



Average Protein & Energy Content for Feeds

FEED	CRUDE PROTEIN	DIGESTABLE ENERGY Kcal/Kg
Oats	10%	2850
Barley	11%	3250
Corn	8.5%	3380
Soyabean Meal	45%	3350
Wheat Bran	14%	2940
Molasses	3%	3200
Vegetable Oil	0.0%	8980
Alfalfa Pellets	16-18%	2150
Alfalfa Hay	16-20%	2200
Timothy Hay	7.5%	1900
Local Grass Hay	6.5%	1800
Grass Legume Hay	12-14%	2100
14% Complete Horse Pellets	14%	2800
12% Horse Textured	12%	3050
Phase 3 Pellet w/Rice Bran	11%	3200

Feeding Rules

1. Water - Horses require a minimum of 3 litres of water for every 1 kg of feed. Requirements can more than double during hot weather along with proper amounts of salt.
2. Keep water troughs clean and filled with fresh water. Dirty troughs can produce toxic compounds.
3. Horses fed alfalfa, timothy, local hay and oats are often deficient in the amino acids lysine and methionine.
4. If you have an overweight horse then reduce the grain portion of his diet. If you have a thin horse, increase the grain portion of his diet. Remember to fortify with minerals and vitamins.

Feeding Rules

5. Fats or oils can furnish 2 ¼ times more cool energy than starch. Allow 1-2 weeks for horses to adjust to feeding additional fats.
6. Horse require all of the standard trace minerals
7. Always have loose salt available free choice as horses cannot get enough from blocks due to limited intake.
8. B-complex vitamins are already added to some feed products to aid horses that may be under stress conditions. Live yeast culture is also added to aid digestion.
9. A good feeding program is always used in conjunction with a good worming and vaccination program. Worms can reduce the ability of the horse to use feed and can cause a blockage in the gut that can cause colic

Feeding Rules

10. Beware of fad supplements, such as natural supplements and herbs etc. There are many on the market, that have virtually no nutritional value and the side effects and research is still unknown. Only supplement when absolutely needed.
11. Always start your horse on grain slowly and change them from one feed to another slowly if need arises. Keep changes to a minimum.
12. Always feed your foals a proper foal feed that has been formulated to help prevent growth problems and to provide proper nutrition.



Feeding Rules

13. Forage should be fed at a rate of 1-2% of body weight. Race horses are sometimes reduced to only 1% of body weight. Endurance horses would need to be on a high forage diet.
14. Insist on clean dust free hay and clean dust free grains and never feed moldy or musty feed to horses.
15. Encourage your horse to drink and eat its forage before feeding the grain ration.
16. Feed horses a minimum of 2 times a day and when possible feed your horse 3 or more times a day. Forage should be fed as often as possible.

Otter Co-Op

Otter Co-op is committed to formulating and manufacturing the highest quality horse feeds and supplements available in British Columbia. Our affiliation with Dr. Stephen Duren / Performance Horse Nutrition as well as our own nutrition department ensures that the latest nutrition breakthroughs and information is incorporated into all our equine feeds. This commitment to quality ensures that our customer's horses are receiving only the finest in equine nutrition.

For more information on our Equine Feeding programs and how your horse can benefit from state of the art horse feeds contact us at 1-800-663-6038 ext. 6931.

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Equine Nutrition 101

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