

Equine Science



Student Reference

10-4610-S

*In cooperation with the Agricultural Education Department and
the College of Agriculture, Food and Natural Resources
University of Missouri-Columbia*



Lesson I: Introduction

Fossil remains of the horse family have been found on the Great Plains. These fossils date back to approximately 58 million years ago. When Columbus came to America, the horse had vanished. There are several theories about why the horse vanished, but the exact reason is still unknown. Horses of prehistoric times were quite small—only about a foot in height—as compared to today's horse that can be more than 18 hands. (A hand is equal to 4".) Unlike the modern horse of today, the first horse, eohippus, had four functional toes and one nonfunctional toe on the front feet. On the hind feet, there were only three functional toes and one nonfunctional toe.

Influence of the Horse Throughout History

In prehistoric times, the horse was sought after as a food source. The first to domesticate the horse is thought to have been a group of nomads who roamed the central plains of Asia. The Scythians used the horse as a food source and to wage war on their enemies. It is thought that the Chinese were the first to keep horses in herds for power and transportation.

During the great migration west in the U.S., thousands of people depended on the horse to transport them. Many times, their very survival depended on the horse. The horse was and still is a companion animal, as well. For the American Indians, the reintroduction of the horse meant great changes in their lives. The Indians quickly discovered that horses were a great partner for hunting and in war, and they soon became very skilled in working with horses.

As mentioned earlier, horses were very important in the great migration west. Wagons containing everything the travelers owned were pulled through mountain passes, across rivers and streams, and across deserts. The horse was a vital part of making our country what it is today.

Return of the Horse to the Americas

Horses have populated the earth almost since the beginning of time, but they had vanished from the North American continent. It wasn't until the late 1400s that explorers such as the Spanish Conquistadors reintroduced them to North America. Columbus first brought horses with

him to the West Indies in 1493, while Cortez brought horses from Spain to Mexico in 1519. The Spanish explorer, de Soto, was the first to bring horses to what is now the United States when he traveled from the Florida Everglades to the Missouri Ozarks. Missionaries also brought horses into the U.S. as they traveled to set up missions with the various Indian tribes.

Changing Roles for the Horse

The horse played an important role in early American development. On the second voyage to the New World, Christopher Columbus brought 25 horses with him. The Spaniards brought more horses with them in the 1500s to Central America. By the 1600s the colonists were settling in the eastern United States bringing their horses as well. The horse was a valuable commodity used for working in the fields, clearing trees, transporting people and goods, and riding in battles.

In the mid-1800s, thousands of people traveled west by horse-drawn and mule-drawn wagons. The horse's use

Table I.1 - Horses on Farms

Year	In Missouri	In U.S.
1890	946,401	15,266,244
1900	908,860	18,267,020
1910	1,035,884	19,833,113
1920	906,220	19,767,161
1925	708,122	16,400,623
1930	597,090	13,510,839
1935	523,648	11,857,850
1940	505,073	10,086,971
1945	476,187	8,499,204
1950	326,473	5,409,417
1954	129,495	2,962,220

Horses and Ponies on Farms

Year	In Missouri	In U.S.
1974	58,712	1,595,640
1978	73,283	1,957,028
1982	76,977	2,260,791
1987	79,436	2,456,951
1992	64,628	2,049,522

Source: 1992 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census.

Equine Science

and popularity steadily increased until the early 1920s. In 1908, Henry Ford started making automobiles that were economical to produce and affordable to drive. Soon after, trucks and tractors started to replace the horse. The numbers of horses stopped declining in the early 1960s, and they have increased steadily since then. (See Table 1.1.)

Today, the popularity of the horse has made a strong comeback, mostly as a source of recreation. In addition, some people still use the horse as a power source to pull wagons and plows or to herd cattle.

Horse Classification

Horses are classified by size, build, and weight into three types: ponies, light horses, and draft horses. Ponies are

less than 14 hands tall and weigh 500-900 pounds. They are often used to pull small carts. Light horses stand 14-17 hands high, weigh 900-1,400 pounds, and are used for riding, driving, racing, or as general-purpose farm workers. The draft horse stands 14-17+ hands and weighs at least 1,400 pounds. Draft horses are much stockier and are used primarily to pull heavy loads.

Table 1.2 shows the annual registration and total registration for the various breeds of light horses.

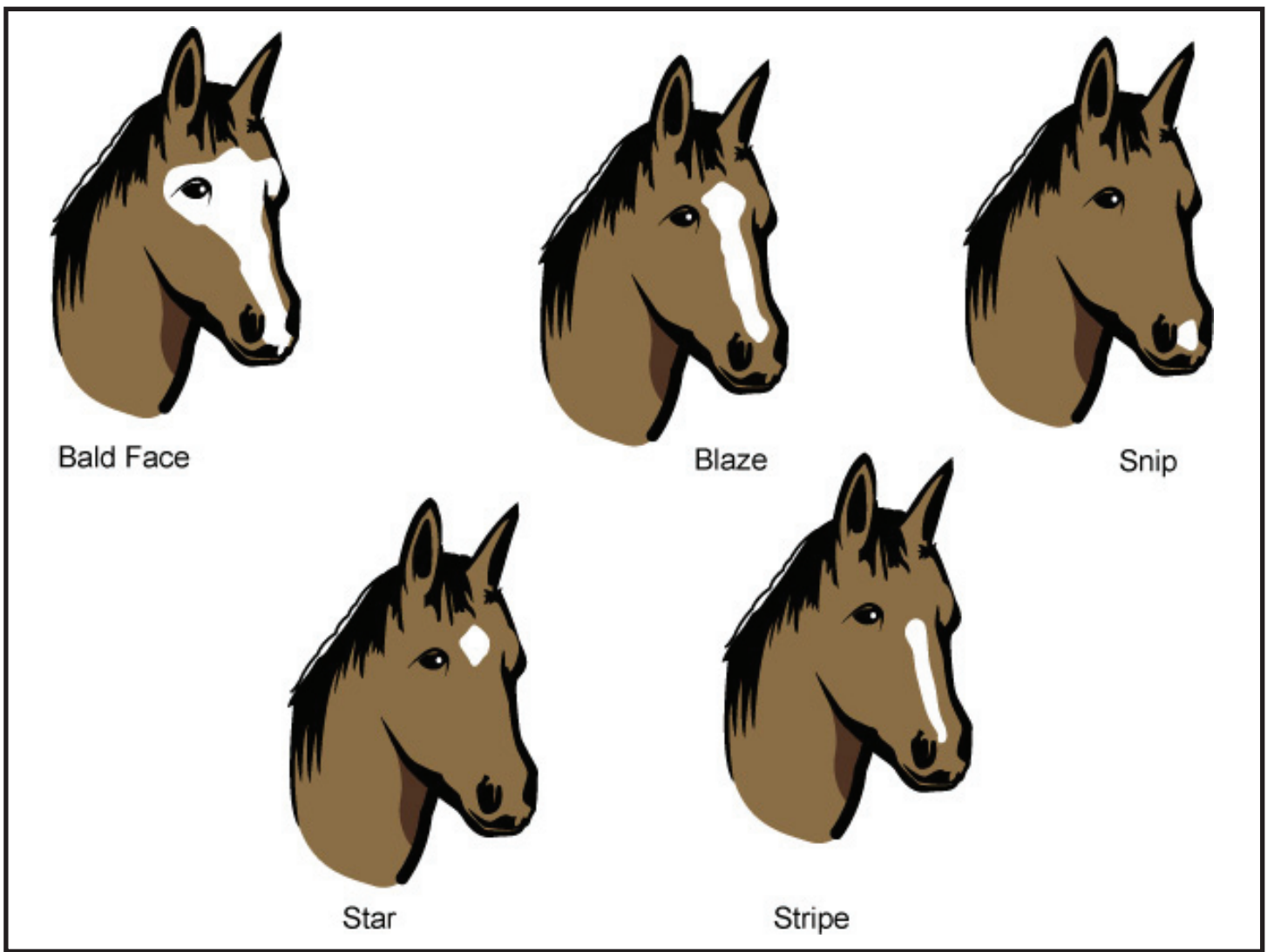
Color – Colors vary a great deal, and certain breeds have special coloring characteristics. Common coat colors in horses are black, brown, bay, and chestnut. From these four, all other combinations are derived, such as white, grey, cream, dun, roan, and pied.

Table 1.2 - Various Breed Registrations (1988-1993)

Breed	1988	1989	1990	1991	1992	1993
Anglo and Half Arab	6,500	4,775	4,276	4,251	3,834	3,668
Appaloosa	12,317	10,746	10,669	9,902	10,033	9,079
Arabian	24,569	21,723	17,676	12,993	12,544	12,349
Hackney	866	779	809	731	464	701
Miniature Horses	3,986	4,636	5,760	5,278	6,500	6,500
Missouri Fox Trotting Horse	1,649	1,737	1,769	1,867	2,250	2,821
Morgan Horse	3,526	3,732	3,618	3,392	2,408	3,120
National Show Horse	978	919	733	624	557	473
Paint	14,929	14,390	16,153	18,648	22,396	24,220
Palomino	1,747	2,080	1,598	1,564	1,358	1,671
Paso Fino	1,464	1,453	1,550	1,483	1,859	1,640
Quarter Horse	128,352	123,294	110,597	101,390	102,843	104,876
Racking Horse	4,475	3,500	4,500	4,500	4,500	4,500
Saddlebred	3,811	3,708	3,569	3,570	3,048	3,353
Standardbred	17,393	16,896	16,576	13,617	13,029	12,086
Tennessee Walker	8,983	8,850	7,972	7,852	8,123	7,510
Thoroughbred	49,219	48,218	43,571	37,442	37,915	35,405
Total	283,115	269,699	249,627	227,237	231,411	231,151

Source: 1995 Horse Industry Directory, Washington, DC: American Horse Council, Inc., 1995, p. 20.

Figure 1.1 - Face Markings



Chestnuts range from light golden-red to a very dark red that is often called a liver chestnut. Bays can be described as chestnuts with black points (mane, tail, and legs). Browns have brown bodies and very dark manes, tails, and legs. Black horses are black all over. White horses are white all over and may have blue eyes. Most white horses are born grey and become whiter with age. Greys are usually one of the common colors at birth and turn grey with age. A roan horse is a combination of the four common colors, resulting in black (blue) roans, bay (red) roans, brown roans, and chestnut (strawberry) roans. A dun horse is a bay with a dark stripe down its back and can have dark stripes on the knees or hocks. The body of cream-colored horses is cream colored, while a Palomino is a cream-colored horse that ranges from light to dark golden with cream mane and tail. Pied horses have large

white areas that alternate with one of the four common colors, such as pied black, pied brown, pied chestnut, or pied bay. See a chart of breeds and coloring for further identification.

Markings – Along with coat coloring, horses have face and leg markings. On the face, these markings are stars, stripes, snips, lips, blazes, and bald faces. (See Figure 1.1.) The star is a star-shaped area of white hair that is located on the forehead. A stripe is a band of white that runs down the face to the nostrils. A white marking on the nose's end only is a snip. A lip is a white mark on the upper lip that can run down to the lower lip. A blaze is a wide strip that runs down from the star, past the nostrils, to the end of the nose; a blaze is the width of the top of the nose. A bald face is a blaze that goes over the nose's edge and frequently includes the eyes.

Equine Science

Leg markings include coronet, pastern, fetlock, cannon, and knee or hock. (See Figure 1.2.) The coronet is a stripe of white hair just above the coronet band. Pastern is from the coronet to just below the fetlock. The fetlock is white from the coronet to the top of the fetlock joint. Cannon marking is from the coronet to just below the knee on the front leg. Knee or hock markings are in the region from the coronet to the knee or hock.

Light horse breeds – Each breed has characteristics that make it unique. Some of the more popular breeds and their characteristics follow.

The Saddlebred originated in the U.S. Saddlebreds are either three-gaited or five-gaited and used primarily as pleasure horses. (Gait describes the way a horse moves, such as walking, trotting, and galloping.) The Saddlebreds are noted for their easy ride and head movement as they walk. They have an attractive head set on a long neck; short, rounded back; level croup; and high tail setting. They are very flashy but usually docile and intelligent.

Appaloosas also originated in the U.S. and are noted for their unusual coat coloring. They have many variations of spotting and can be any combination of colors. All have a white circle around the eye and vertical striping of the hooves. They have been used for war, racing, and buffalo

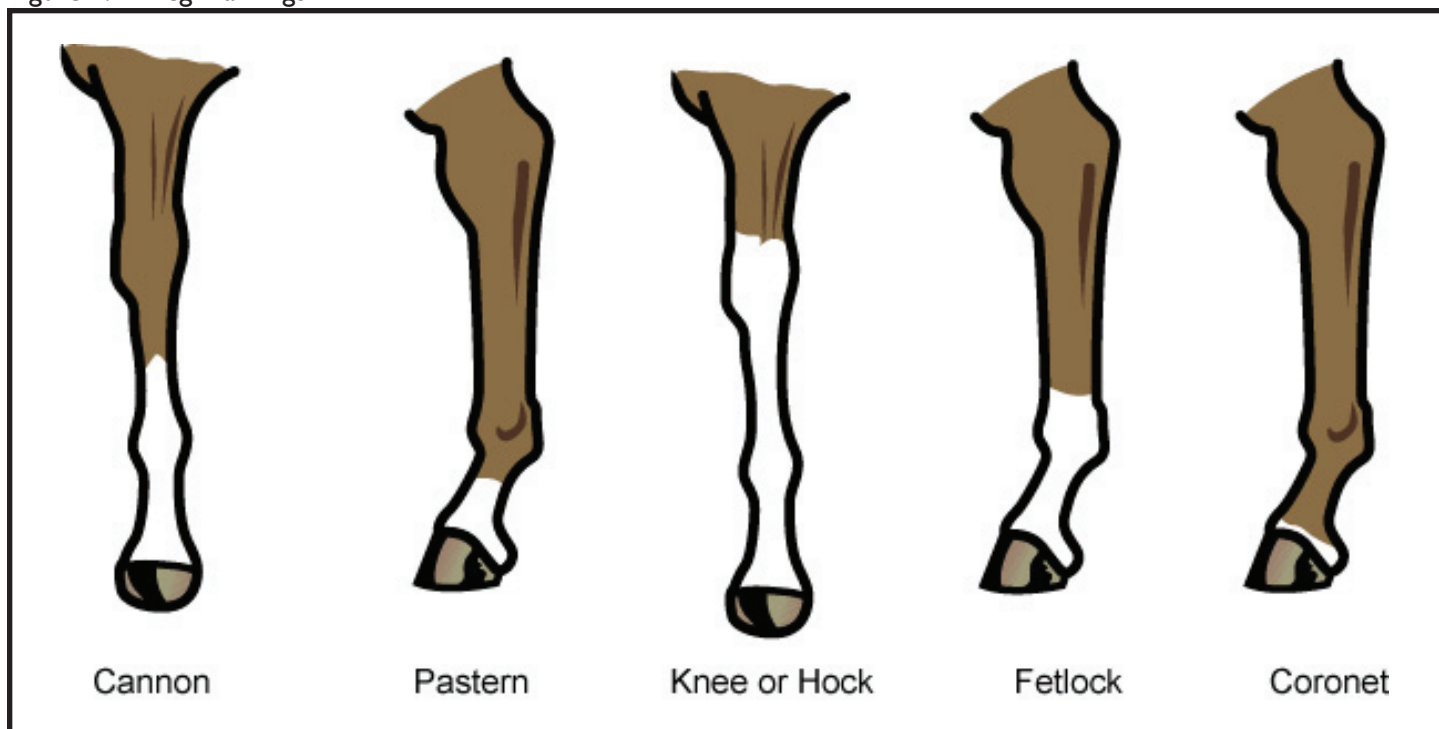
hunting; they played a major role in the development of the early-day livestock industry. Today, they are primarily used as a pleasure horse.

Arabians are credited as the foundation of all light horse breeds. They are noted for having beautiful tapered heads with dished faces; short, alert ears; large, wide-set eyes; large nostrils; and deep, wide jaws. Originating in Arabia, they are primarily saddle horses, but are also used as stock, racing, and pleasure horses.

Another American horse is the quarter horse. They were the earliest U.S. race horse. Quarter horses are noted for their heavy, well-defined muscling; large heads with large, prominent jaws; small, alert ears; well-developed necks; and short, heavily muscled backs. They were developed for racing and ranching. They are fast and very agile with athletic abilities that are unsurpassed.

The Missouri Fox Trotter is a breed that originated in the hills of the Ozarks around Ava, Mo. It is noted for its sure-footed, easy gait and very smooth ride. The breed registry was established in 1948 and is located in Ava. With its smooth ride, poise, and easy manner, the Fox Trotter quickly became known as the common person's pleasure horse.

Figure 1.2 - Leg Markings



Draft horses and ponies – Originating in Europe, draft horses are known for their massive bulk, great strength, and gentle manner. They are used primarily to pull great weight and are still used in some areas to pull plows and wagons.

Most ponies, with the exception of the Pony of the Americas, were developed in Europe. They are small and used as children's horses and to pull small carts.

Summary

The horse has had a large impact on people's lives throughout history and will probably continue to grow in popularity. Horses come in many shapes, sizes, colors, and uses. People today enjoy horses in a variety of activities; their love and fascination of the horse will undoubtedly continue.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

Equine Science

Lesson 2: Psychology and Handling

Horses are much stronger than people, so it is much better to get a horse to do something because it wants to do it. Generally, one person cannot force a horse to do something it does not want to do. This makes it important to understand how horses think and how they will react under certain circumstances.

When working with any horse, it is important to reinforce actions that are desirable with praise. When undesirable actions happen, they should immediately be met with some sort of punishment. Using positive and negative reinforcement is an important part of any horse's training.

Reaction to People

Like people, horses have their own personalities. Some are very jumpy, easily spooked, or aggressive, while others are calm and docile. Some horses show a great deal of loyalty and affection to their owners, while others are very independent.

Signs of Danger

When the horse appears nervous or agitated, there's something wrong. Observing these signs will help a handler avoid injury. A horse's handler should be aware of danger signs and react accordingly. One of the best indicators is the horse's ears because they show which way the horse is looking. (See Figure 2.1.)

If the ears and eyes are relaxed with the ears dropped back, the horse is resting or asleep. If both ears are perked up and forward, it is interested in something. A horse can look and listen in two directions at once. If one ear points forward while the other is pointing to the rear, the horse is watching both directions. When a horse pins its ears back, it is angry and there is a danger of being kicked.

How a horse holds its tail can also communicate. If the horse switches its tail, something is bothering it—flies or something the rider is doing.

Pawing the ground is another sign that a horse is not pleased. This can mean that it doesn't like something, or it might be because the horse has been tied up and is bored. Whatever the signs, the handler should get to know the animal and never ignore what it is trying to "say" so that an injury can be prevented.

Horse Manners

As mentioned earlier, each horse has its own personality and can develop good or bad manners. There are several bad manners (vices) that horses sometimes pick up; some of them can affect the horse's health.

Barn sour – With this vice, the horse doesn't want to leave the barn. This can be the result of not wanting to leave a companion or the safety of the barn. A preventive measure is to work the horse after returning to the barn area.

Biting – Biting can be caused by innocently giving the horse treats or by rubbing its nose while petting.

Bolting feed – It is not known for certain why some horses gulp (or bolt) their food, but they can be slowed down by spreading the food out or placing a large, baseball-sized rock in the feed.

Cribbing – This is when a horse hooks its upper teeth on a solid object, extends its neck, and sucks in air. This bad habit can cause bloating, and horses that crib often are more prone to get colic.

Pawing – Here, a horse stands and digs at the ground with its front feet. Many times, this is a sign of boredom and releasing them into a paddock or field will help prevent it. Occasionally, pawing the ground means the horse is sick.

Shying – Some horses seem to be easily spooked by unfamiliar items. The only things that can be done are to develop trust and use good training methods and patience.

Weaving, stall walking, and wood chewing – These vices are usually brought on by boredom and can be corrected by allowing the horse to get outside and exercise.

Equine Senses

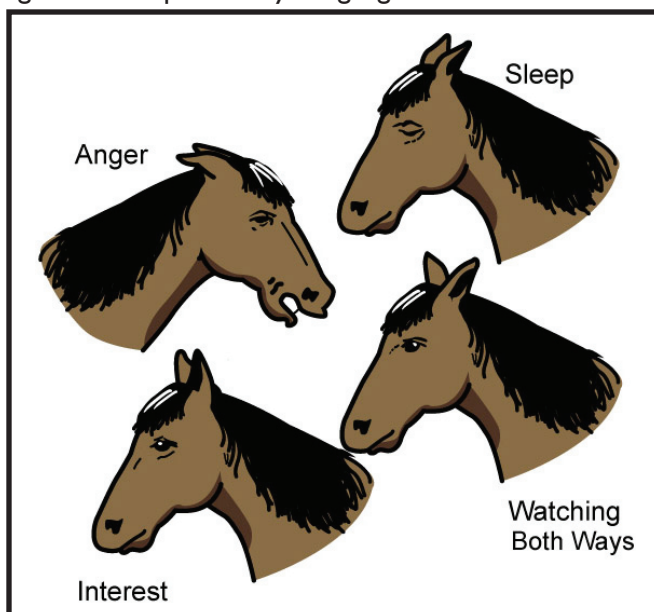
The horse has monocular vision, which gives it the ability to use each eye independently and see different pictures at the same time. When a horse wants a good look at something, it looks straight at it and uses both eyes in a binocular manner. The horse does have two blind spots—directly in front of its nose and directly in back of the horse. This is why a horse should always be approached from the side or at an angle, never from the rear or from straight ahead. Horses have very good night vision. It is a good idea to talk to horses so they also hear you coming.

The horse is much better at detecting something approaching it than most animals. With its monocular vision and excellent hearing, it can watch a greater area than a cow or most other animals. This is why horse warriors always paid close attention to horse signs.

Foal Handling

The newborn foal should be worked with as soon as possible. Rubbing the foal's body with a towel or gunny sack (sacking) helps get it used to handling. Start the foal on a regular routine of a short lesson, such as putting on a halter, at about 1-2 weeks of age. After the foal is used to the halter, tie it to the stall near the mare and groom it, working with the legs and hoofs. Well-disciplined horses result from early training.

Figure 2.1 - Equine Body Language



Training Methods

Trainers have their own style of training; however, certain things should remain constant. When teaching a horse a new lesson, patience is a must. Repeating what the horse is to learn is a must. It might take several days, weeks, or even months of practice before the horse has learned it thoroughly. Positive reinforcement should always be used, either by verbal praise or by giving it some kind of treat. Don't overdo the treats, however; give them only when deserved.

Discipline is a means of communicating to the horse that it is doing something wrong. It is not being mean, nor is it mistreatment—unless it becomes excessive or inflicts injury to the animal. Mistreatment will be avoided if one never punishes out of anger.

Discipline should always be prompt and never administered out of anger. The whip and spurs are the most common devices used to discipline a horse. If a horse fails to carry out a command and discipline has been given, promptly make the horse follow through with the original command and follow that by positive reinforcement.

Summary

Horses are like people in that each has its own personality and can form vices. Handlers should become well acquainted with their horses and know how each horse reacts to handling. Training the horse at an early age will help eliminate problems with temperament and result in an animal that is easy to work. Routine, frequent handling is the key to a steady horse. Training styles differ, but the basics are the same—repetition, reinforcement, and discipline.

Credits

Fraser, A. *The Behavior of the Horse*. Melksham, U.K.: Redwood Press Ltd., 1992.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

Lesson 3: Conformation and Selection

Selecting a horse is somewhat like buying a car. Everyone wants four good tires, no major flaws in the body, two working headlights, good air intake, a sound motor, and a solid exhaust. Of course, the emphasis placed on a particular characteristic can vary, depending on the owner's needs and skill level. A draft horse is not suitable for someone with limited means to feed it, for example, just as a large, high-strung horse is not appropriate for a child.

Characteristics of a Good Horse

In general, the horse should be healthy and of normal weight. There should be no outward signs of disease.

Gender – After the class and breed have been selected, gender is the next decision. There are five choices: mare, stallion, gelding, colt, or filly. A mare is the adult female and can be a good pleasure horse or can be used for breeding. The stallion is an adult male and can also be used either as a pleasure horse or for breeding. However, a stallion can be more difficult to work with and frequently will not be the best choice for a pleasure horse, especially for a beginner. A gelding is a male horse that has been castrated and cannot reproduce. Geldings make very good pleasure horses because they do not exhibit any of the aggressive breeding characteristics that a stallion will when around mares. Colts are young male horses, and fillies are young females that have not foaled.

Leg structure – The next category to consider when buying a car is the tires; with a horse, it is the legs. Leg structure is very important. The leg should be straight and well muscled. If the horse has any defects in leg structure, problems can develop with the pastern, knee, shoulder, or hip. These problems can make the horse unsound to ride.

When looking at the chest, the ideal front legs are shown by drawing a straight line, perpendicular to the ground, from the point of the shoulder to the tip of the hoof on each leg. The legs would be in two identical segments from hip joint to hoof. Toes should point forward.

From behind the horse, find ideal hind leg structure by drawing imaginary, perpendicular lines from the points of the hip to the ground behind the heels. The line makes two equal halves, as with the front legs.

The head and muscles – The horse should have adequate muscling for its breed and a well-shaped head. It should have large, wide-set eyes that are bright and alert. A horse that has small eyes is likely to have poor vision and be easily spooked. Large, wide nostrils permit proper air intake. If the horse has small nostrils, it might not be able to breathe properly when asked to run or work hard.

Teeth – Deformed or poor teeth can cause weight loss and poor conditioning. This can lead to other problems, such as colic, impacted bowels, or in extreme cases, even death.

The teeth are the best indication of a horse's age. This is because teeth develop at different ages and wear at a certain rate, which can be correlated to the horse's age. Foals develop temporary teeth at about 4 weeks of age, starting with the front incisors. By about 9 months of age, all of the temporary teeth are in. At about age 2, permanent teeth replace the temporary teeth, starting again with the front incisors and working around to the back. Temporary teeth are whiter, smaller, and cup-shaped, while permanent teeth are off-white and more rectangular in shape.

It takes about 4½ years for all the permanent teeth to come in. They will all have a black area on top of the teeth, which wears off with age. At age 7, if the horse has not had its teeth floated (filed), a spot known as the seven-year hook will develop on the inside incisor. By the time the horse is 8 years old, all the black has worn off, and at age 10, a groove will appear on the inside incisor. As a horse further ages, the teeth wear and slightly protrude.

Because of the wearing of the teeth, it becomes necessary to float the teeth (file them) to keep sharp edges from developing that would cut the gums and make eating difficult and painful.

Equine Science

Temperament

A horse should have a good temperament; it should not be jumpy or aggressive. Many times, temperament problems are associated with such characteristics as small eyes, poor eyesight, or some other structural problem. Remember, a horse with a poor temperament (bad attitude) can cause many hours of problems or even injuries.

Balance and Soundness

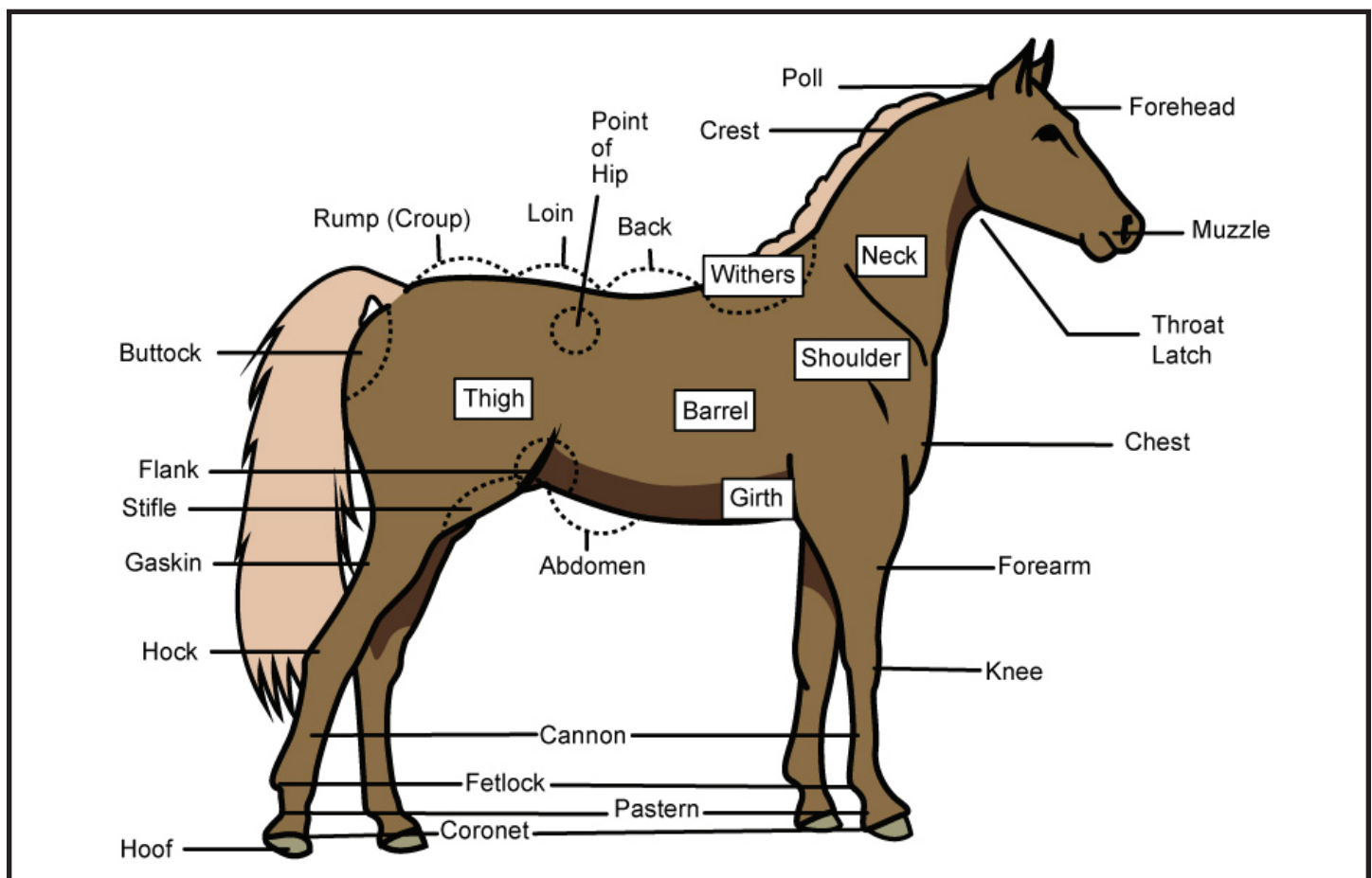
If possible, ask the veterinarian to look at the horse for internal problems or structural defects.

Balance – The horse should be properly proportioned. The head should not be too small for its frame, nor should the neck be too long. If the horse does not have a good balance to its body, it can be prone to stumbling. (See Figure 3.1 for parts of a horse.)

Soundness – Buying a horse that is unsound can cause problems in the future. The horse might appear to be all right, but as it ages, the defects can progress to a point that the horse will no longer be sound enough to ride. Some slight blemishes, however, might not cause any problems at all; they may be mere imperfections in appearance that do not interfere with performance.

In general, structure can be broken into two categories—blemishes and unsoundness. A blemish is something that does not interfere with the horse's performance. Anything that interferes with the horse's ability to perform makes it unsound. An unsoundness can be an inherited trait or it can be caused from some outside influence such as stress, strain, injury, or nutritional deficiency. Some minor defects, such as in travel or gait, can be corrected by shoeing.

Figure 3.1 - Parts of a Horse



Disreputable dealers can disguise defects. Always buy from a reputable owner who is willing to allow a veterinarian to examine the horse.

Performance Records and Pedigrees

Performance records – These records can be a great help when selecting a horse, especially if the horse will be used for breeding. Because of inherited genetic characteristics, the ancestors' performance can be a gauge of how well the offspring will do. The Thoroughbred breed registry was the first to use performance records. This registry recorded pedigrees of all horses that won important races, which is often recorded on the horse's registration papers.

Pedigree – A pedigree is simply a record of the horse's ancestry, which is often recorded on the horse's registration papers. It is much like a person's family tree. It is used to look back in time to find out which horses were bred to sire certain offspring. Pedigrees are used in conjunction with performance records to help predict how the offspring might be expected to perform.

Even more important than the horse's pedigree is the breeder's reputation. Look for breeders who will stand behind the quality of their animals.

Summary

To get a horse with desirable traits, attention must be given to the horse's conformation or makeup. Buying a horse is much like buying an automobile; if component parts are not well inspected, the buyer might end up with a lemon.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

University of Missouri-Columbia Extension Division
agricultural publications

- a. G2840: Unsoundness and Blemishes of Horses: Feet and Legs
- b. G2842: Determining Age of Horses by Their Teeth
- c. G2843: Leg Set: Its Effect on Action and Soundness of Horses

Lesson 4: Genetics and Reproduction

Genetics determines the type of foal that will be produced. Understanding genetic influences will help a breeder select the highest quality animals possible for mating. Also, ensuring healthy births is critical to a productive operation since a horse's gestation period is 11 months long.

Genetic Characteristics

The characteristics that a breeder looks for in a horse, such as color, muscling, stamina, and speed, are somewhat breed specific. The field of study that explains this is genetics. Genetics deals with gene combinations and how genes are passed on from generation to generation (inheritance). With horses, it is somewhat difficult to advance genetic material because only one foal a year is produced.

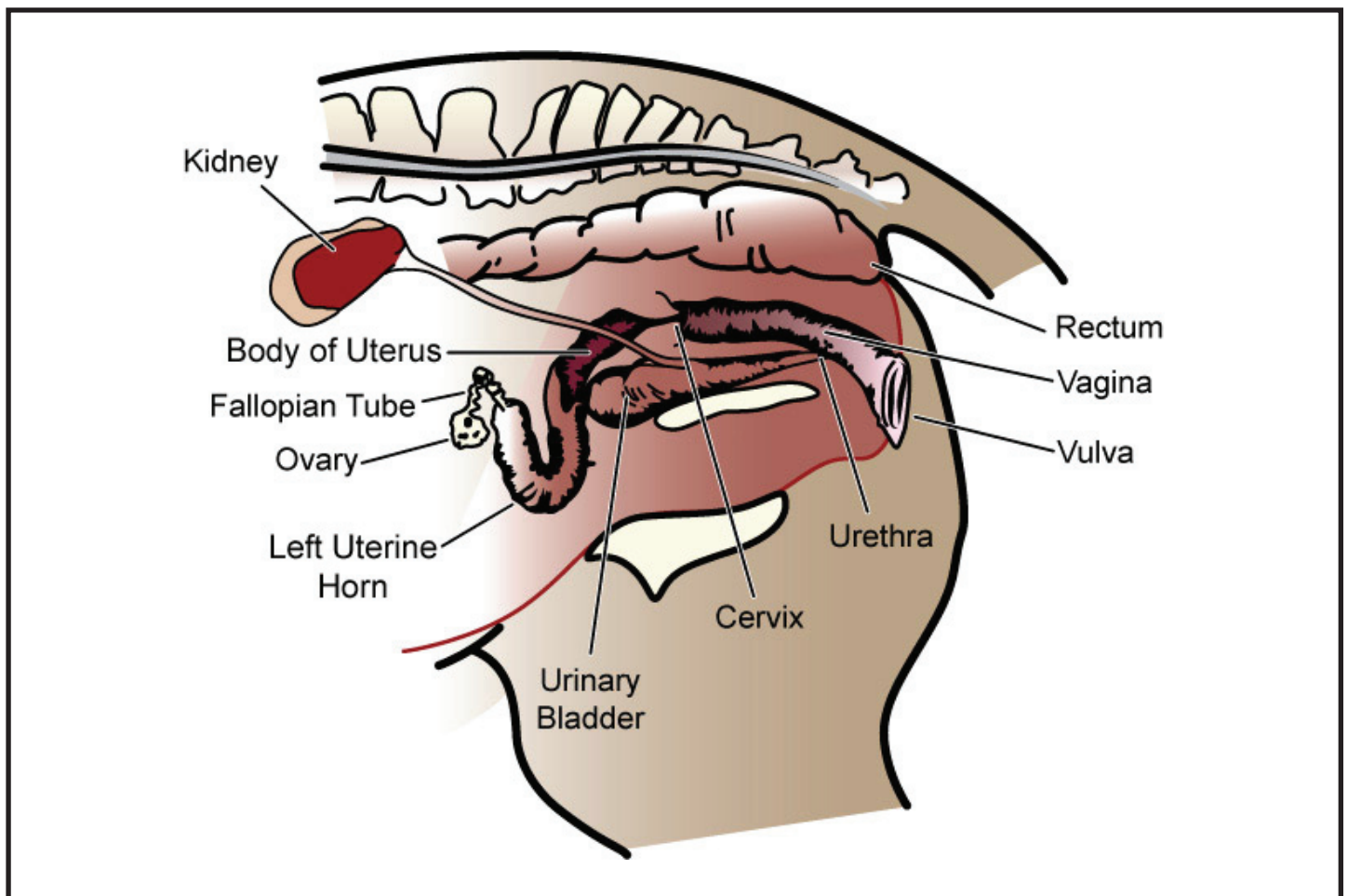
Breeders have been selecting for different characteristics for hundreds of years by breeding the best to the best. However, sometimes the foal is less desirable than the parents. The mare and stallion may have recessive genes that, when linked together, produce weak or lethal genes. This combination will cause severe defects and even death in foals. One lethal gene combination results in albinism, which causes the all-white foals to die, usually before birth.

The horse has a total of 32 chromosome pairs. When a mare is mated to a jack (the male of the ass family), it produces a mule. Mules are usually infertile because of the difference in parental chromosome numbers. This crossing of two different families produces a hybrid.

Reproductive Tract of the Mare

The reproductive tract of the mare is designed to produce the eggs (ova) and to provide a safe environment for the embryo to develop. After the embryo has fully developed,

Figure 4.1 - Mare Reproductive Organs



Equine Science

the mare expels it to the outside world and provides it with nourishment until the foal has grown to sufficient size.

The ova (eggs) are produced in the ovary and are expelled from a blisterlike sac that forms on the outside of the ovary. Ova travel from the ovary to the fallopian tubes, which carry them down through the uterine horn to the uterus. (See Figure 4.1.)

After fertilization, the embryo attaches to the lining of the uterus by the umbilical cord. Before the embryo gets to the uterus, the uterus develops a thick lining of blood vessels. This lining supports the embryonic sac, which makes up the afterbirth. At the end of the uterus is a strong muscle called the cervix, which keeps foreign matter out of the uterus. The cervix leads to the vagina (birth canal), which is where semen is deposited by the male and, after gestation, where the newborn exits to the outside world.

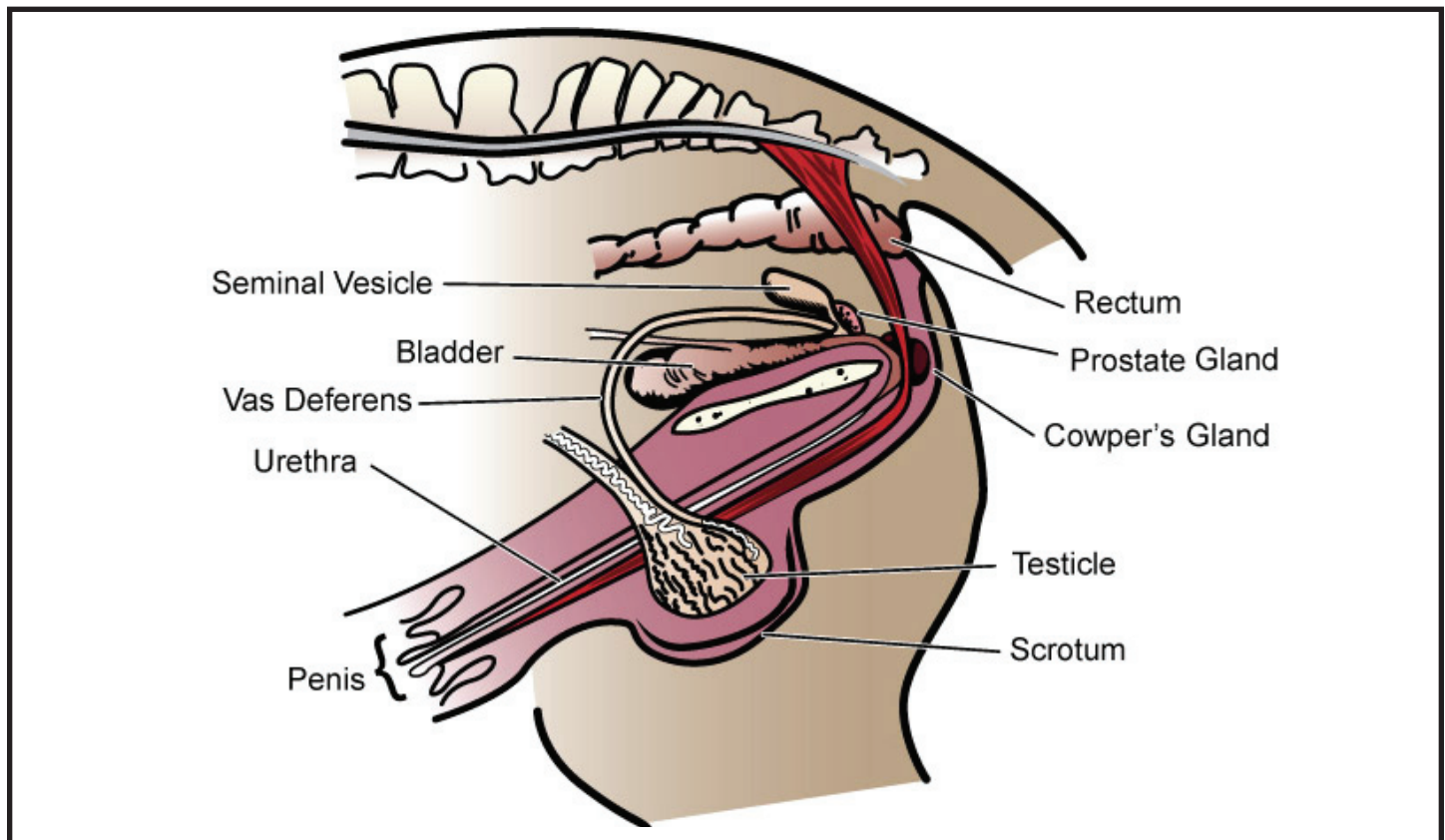
The mare is receptive to the stallion only during parts of her estrous period. The breeding season varies from mare to mare, but on the average runs from mid-April to

mid-October. The mare goes through a series of cycles that are about 21 days long. An ovum from the mare can become fertilized during a seven-day period in the middle of her 21-day estrous cycle. If the mare has not been bred successfully at that time, the cycle will repeat. In terms of handling, mares are frequently more temperamental during heat.

Reproductive Organs of the Stallion

The stallion's reproductive tract is designed to produce sperm cells and to transmit the sperm cells to the female's tract to fertilize the ovum. Sperm is produced in the testicles and is transmitted down a tube called the vas deferens. The vas deferens connects to the urethra just behind the bladder. The urethra acts as a common transportation tube for both urine and sperm cells. Along the urethra are three accessory glands: the seminal vesicles, the prostate gland, and the Cowper's gland. These glands produce fluids that help nourish the sperm and provide a transportation medium through the urethra in the penis. (See Figure 4.2.)

Figure 4.2 - Stallion Reproductive Organs



Methods of Reproduction

Nature needs no help to reproduce in the wild, but since domestication has changed the life of the horse, people have had to develop ways to assure that reproduction takes place at convenient times. In *natural (pasture) breeding*, the mare and stallion are allowed to run in the pasture and bred naturally. With this method, the breeder probably will not know when the mare is due to foal.

Many breeders want to know when the mare will foal, so the method of hand breeding is used. This method involves taking the mare to the stallion, which is tied to a rail, fence, or post. (See Figure 4.3.) When teasing the mare, the stallion is allowed to check the mare to see if she is in the appropriate part of the estrous cycle and will allow the stallion to service (breed) her. A mare that is not in estrous will aggressively kick and paw the stallion and not allow him to approach her. A mare that is in estrous will go through several gestures, such as winking. Winking is when she lowers her pelvis and raises her tail in a submissive manner, allowing the stallion to breed her.

Artificial insemination (AI) is not used very much in horse breeding because some breed registries will not register the foal if breeding is done in that manner. Another

problem is that the semen does not freeze as well as it does in other animals, such as cattle. AI does have several advantages. One advantage is that it will allow one stallion to breed as many as 500 mares in one season, as compared to 80 in natural breeding or hand breeding.

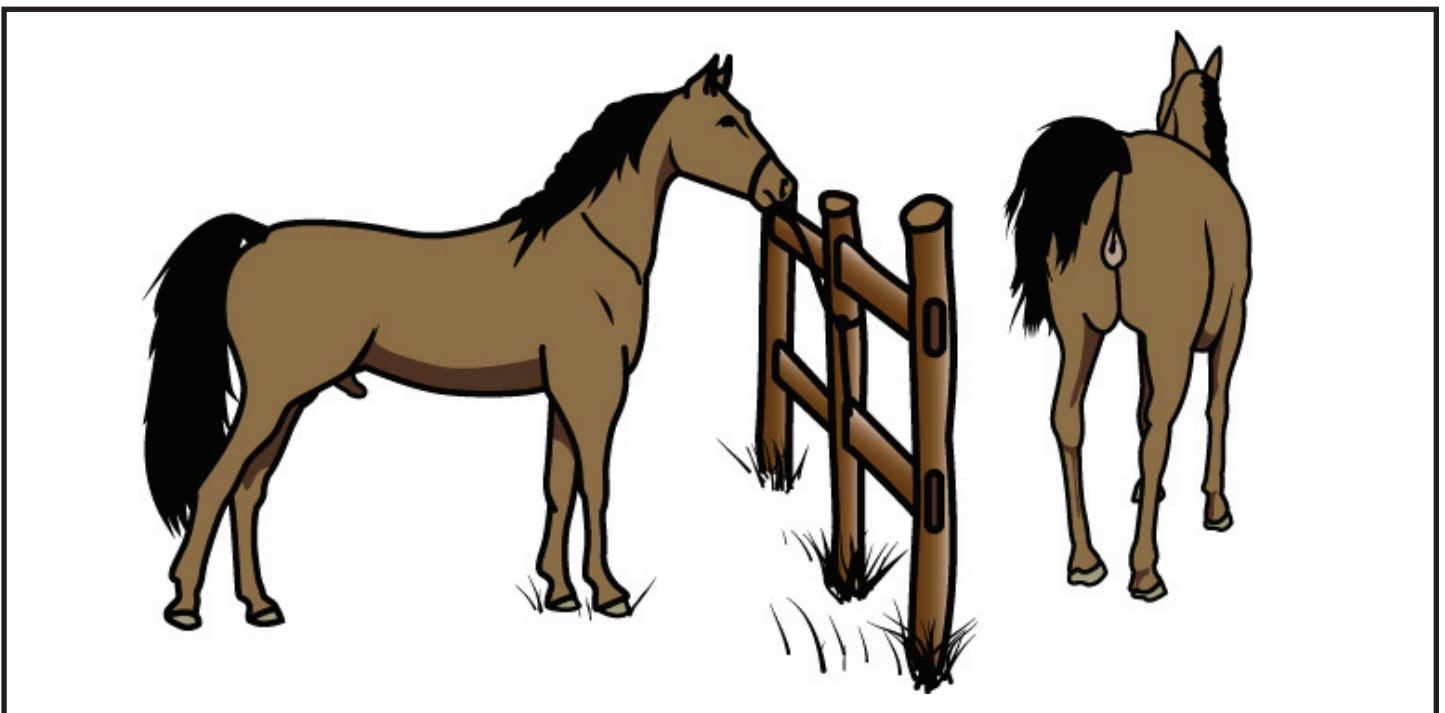
There are three steps to using AI. The first step is the collection of the semen. The next step is the evaluation of the semen. The last step in AI is insemination of the mare.

Parturition

Parturition is the process of giving birth. Waxing, the first sign that a mare is going to foal, takes place 2-4 days before foaling. The mare's teats secrete a waxy substance. However, not all mares do this. The next sign is when the mare's udder begins to get hard and full-looking. The mare's vagina muscles begin to relax, getting ready for the birth. The mare might also show signs of irritability and wish to stay in the quietest area.

During the actual birth, there are three stages. In the first stage, the mare might sweat, be agitated, paw the ground, or lie down and get up several times. She will not show signs of straining, but the water might break. During stage two, the mare will show visible signs of straining, and she

Figure 4.3 - Teasing the Mare



Equine Science

will either lie on her side or sit. Fetal membranes will appear from the vagina as she strains. As she progresses, the foal's feet appear first, followed by the nose, which is the start of stage three. After the foal's head appears, the shoulders follow, and the rest of the birth is fairly rapid. After the foal has been delivered, the afterbirth will be expelled in 2-3 hours.

Dystocia

Dystocia refers to anytime a mare has difficulty giving birth to the foal. This can be caused by several things, such as the foal being too large for the birth canal, one or both of the legs being caught inside, the foal coming out rump first (breech), or if twins are present. Any time a mare strains or has contractions for longer than normal, a veterinarian should be called to assist.

Table 4.1 - Normal Delivery Stages	
1. Preparatory	30 min. to 4 hours
2. Delivery	20-30 minutes
3. Delivery of placenta	30 min. to 3 hours

Dystocia can be caused by many things, such as age, proportion of the mare to the foal, breech births, or a foal tangled in the umbilical cord. Other possible causes of dystocia can be disease or improper diet.

Afterbirth

It is important to check the afterbirth as soon as it has been expelled to make sure it all came out. (The placenta should be in the same basic shape as the foal.) If there are holes or unusual tears in the placenta, part of the placenta might have been retained in the uterus. Call a veterinarian to assist.

A retained placenta causes inflammation/infection of the uterus, which can trigger laminitis (founder). In foaling founder, the uterus becomes inflamed from some type of abrasion during parturition. This inflammation can also trigger founder (laminitis).

Colostrum

Colostrum is the first milk that the mare produces. It is thick and yellowish and contains antibodies that give the foal immunities against infections and diseases. Colostrum is higher in protein and antibodies than regular milk. The colostrum lasts only for a few days, and it is very important that the foal gets this first milk, as it is sometimes referred to, to help ward off disease or infection. As with other species, it is critical that the foal nurses within the first two hours.

Summary

The process of life is the most remarkable process in all of nature, and the birth of a new foal is a wonderful thing to see. Considerable care must be taken from breeding to birth to ensure that the foal has every chance of surviving and thriving.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

University of Missouri-Columbia Extension Division
agricultural publications

- a. G2790: Horse Breeding Arithmetic: $2 + 2 = 1$
- b. G2791: Genetics of Coat Color of Horses

Lesson 5: Herd Health

It is essential that owners have health programs to take care of their horses. For breeders with many horses, it becomes even more important because the herd provides an income. When unsure about an injury's seriousness, contact a veterinarian.

Vaccinations and Vaccines

"An ounce of prevention is worth a pound of cure" describes the importance of preventing problems before they happen. It takes a great deal of time and expensive care to help a sick animal regain its health, compared to the small cost of a vaccine. A vaccination program is recommended to help prevent diseases that are common among horses. There are many different diseases that can affect a horse, and it is best to consult the veterinarian as to what specific disease should be vaccinated for in the area. The veterinarian can also help with developing a vaccination schedule.

The type of vaccine will vary. Some vaccines provide lifetime protection, while others need an annual booster. The type of vaccine needed will depend on the protection needed and vaccine availability. Most vaccines today have fewer side effects than vaccines of years ago.

Diseases That Horses Can Be Vaccinated Against

There are many different vaccines available; consult the veterinarian as to what is appropriate in the area. The three most common diseases that horses are vaccinated against are influenza, sleeping sickness, and tetanus.

Influenza is a highly contagious disease that affects young horses. The symptoms include high fever, loss of appetite, weakness, depression, rapid breathing, dry cough, and a watery discharge from the eyes and nostrils that is followed by a yellowish nasal discharge. Mortality (or death rate) is low, but recovery can take weeks or even months.

Sleeping sickness (EEE, WEE, and/or VEE) is carried by mosquitoes, and both horses and humans can contract the disease. The symptoms include walking around aimlessly and running into things; depression; grinding

of teeth; and paralysis of the limbs, lips, and bladder. The mortality rate can be as high as 90 percent.

Tetanus (lockjaw) usually occurs as the result of an infected wound. Symptoms can include stiffness around the head and difficulty chewing and swallowing. The stiffness or paralysis progresses throughout the body and muscle spasms can occur. The mortality rate is 80 percent due to the exhaustion and/or paralysis of vital organs.

Viral rhinopneumonitis (Rhino) causes a pregnant mare to abort the foal in the last half of the term. Mares can catch this virus easily from other horses, and the symptoms are similar to a cold or respiratory disease. All horses are susceptible to the virus. Rhino can be prevented by keeping pregnant mares away from others or by keeping them in small groups. Also, weanlings and yearlings should be kept away from pregnant mares.

Strangles (or distemper) is a communicable disease that usually affects younger animals. Symptoms include depression, loss of appetite, high fever, and pus-like discharge from the nostrils. As the disease progresses, glands under the jaw enlarge and become sensitive. These glands can break open, allowing pus to drain out. Strangles can spread to internal organs, but as soon as drainage occurs, glands can heal. However, if it spreads to internal organs, the horse may die. Treatment varies and depends on veterinarian recommendations. The spread of strangles can be controlled by keeping infected animals away from non-infected animals. It can also be prevented by vaccinating the entire herd.

Vaccinations might be needed for other diseases, such as rabies and viral arteritis. Consult the local veterinarian for recommendations.

Ailments Common to Horses

Colic can be fatal if not treated properly. Contact the veterinarian as soon as possible. Symptoms include pawing at the ground, looking nervously at the flanks, continually lying down and getting back up, rolling, sweating, constipation, and the absence of normal intestinal sounds. To avoid intestinal twisting (gastric torsion), the horse should not be allowed to roll or get up and down. Walk the horse slowly, if possible, and don't feed it until the veterinarian arrives.

Equine Science

Equine Infectious Anemia (EIA or Swamp Fever) is a serious blood disease. Symptoms can vary but include high intermittent fever, depression, stiffness, weakness, loss of condition and weight, and swelling. An afflicted animal can die within 2-4 weeks. There is no vaccine available. However, a Coggins test can detect the disease. When a positive Coggins test results, the animal should be quarantined and slaughtered.

Potomac Horse Fever is an often fatal form of diarrhea. Symptoms include fever, depression, loss of appetite, colic, and edema (swelling) of the underline (belly). These symptoms are followed by severe watery diarrhea. Many horses with this ailment develop founder, and the mortality rate is about 30 percent. Horses that contract Potomac Horse Fever are given large amounts of fluids intravenously and medications to reduce the fever and the chance of founder. A vaccine is available, and a veterinarian should be consulted to see if it is needed in the area.

Salmonella is the bacterium that causes symptoms resembling colic, which makes it difficult to diagnose. Suspected horses should be checked by a veterinarian. Prevention practices include keeping feed clean and free from contaminates, along with quarantining of new animals.

Dental Care

Because of the way a horse's teeth wear, they will develop sharp edges on the molars that cause cuts to the gums.

This will cause pain for the horse as it tries to chew its food (mastication process). For this reason, it becomes necessary to float the horse's teeth (file off the sharp edges).

Observe the horse as it eats. Usually, a horse with this problem will eat very slowly, dribble food out of its mouth, salivate excessively, and might have blood mixed with saliva. Wasted feed frequently ends up on the ground. As a result, the horse can lose weight and conditioning. Floating the teeth should be done by a veterinarian or someone with experience and training to prevent injury to the horse's mouth.

Parasites

There are two classifications of parasites—internal and external. A parasite is any form of life that lives off of another. Parasites usually don't kill their host but do cause it to be unthrifty and perform at a lower level.

Symptoms of internal parasite infestation include unthriftiness, rough coat, recessed flanks, distended abdomen, and weakness. Prevention involves a deworming program. To prevent parasites from developing immunity to a specific dewormer, rotate the brands used. There are several different types of dewormers on the market; consult the veterinarian as to what will work the best in the area.

Table 5.1 - Internal Parasites of Horses

Credit: *Controlling Internal Parasites of Horses (G2854)*

Parasite	Location	Ages affected	Injury and symptoms
Strongyles	Larvae: arteries, liver and gut wall Adults: large intestine	All ages but young especially susceptible	Retarded growth, loss of weight, poor appetite, rough hair coat, general weakness, anemia, recurrent colic, death
Ascarids	Larvae: liver and lungs Adults: small intestine	Young under 2 years old	Retarded growth, pot bellied, rough hair coat, colic, pneumonia, death (ruptured intestine)
Bots	Eggs: on hair Larvae: tongue Bots: stomach	All ages	Excitement (by flies), colic, retarded growth, poor condition, death (stomach rupture)
Tapeworms	Adults: junction of small intestine with large intestine	Six months or older	Digestive disturbances

Along with a deworming program, make sure the environment around the horses cuts down on many of the problems associated with parasites. Keep stalls and paddocks clean and free from manure buildup. Dragging of fields (to break up manure piles) and rotating pastures will help lower the parasite population. If possible, avoid feeding horses on the ground where they can ingest parasites with the feed; provide a feeder that is clean and above the ground.

There are about 150 different types of parasites that can affect a horse. Some of the most common internal parasites that affect horses are found in Table 5.1.

External parasites include flies, ticks, mosquitoes, mites, and lice. Some of these external parasites are the source of the internal parasites, such as the botfly. The botfly lays its eggs on the horse's legs and jaw, and the larvae soon enter the horse's mouth and are swallowed. They are eventually passed back out with the feces and the larva mature to the fly stage, where the cycle starts over again. (See Figure 5.1.)

There are several ways to help reduce external parasites, such as keeping the area clean of manure buildup, not having too many horses in one area, and using insecticides that are especially made for horses. Again, it is wise to contact a veterinarian as to what will work best and be the safest.

First Aid

Lesson 8 discusses the contents of a basic first aid kit. First aid is the immediate and temporary aid given for an animal that has been injured or become ill. For any injury involving bleeding, first stop or at least control the bleeding by applying gauze and pressure to the wound. If the wound is slight and bleeding is minimal, applying an antibiotic to the wound might be enough. However, if the wound is worse, a veterinarian should be called to inspect it and decide if stitches are needed.

Foot punctures occur most often. Clean punctures of any dirt or foreign objects. The wound should then be treated with an antiseptic and watched for infection. If the wound has a small opening, enlargement of the opening might be necessary so it will drain. Enlargement of a wound usually requires the services of a veterinarian.

For bites and stings, clean the wound (as with any injury) and apply an antiseptic to the affected area. Determining the cause makes prevention much easier. If the horse acts unusual or has any excess pain or swelling, consult the veterinarian.

For strains, sprains, and swelling, restrict the horse's movements to prevent any further injury and apply cold water to the affected area. These measures help reduce swelling and relieve pain. Apply the cold water intermittently for the first 24 hours, at least. After all the swelling has stopped, warm compresses or liniment can be applied to stimulate the healing process.

If a horse is suspected of founder, the veterinarian should be contacted and the horse should be confined in a stall. Don't give feed and restrict it from drinking large amounts of water until the veterinarian advises otherwise.

Summary

The horse's health is in the owner's hands. It is wise to have a trusted veterinarian nearby to answer any health questions that arise. Also, the veterinarian can help create a health program that will keep animals in good health for years.

Credits

Controlling Internal Parasites of Horses (G2854).
University of Missouri-Columbia Extension Division,
1993.

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed.
Danville, IL: Interstate Publishers, Inc., 1990.

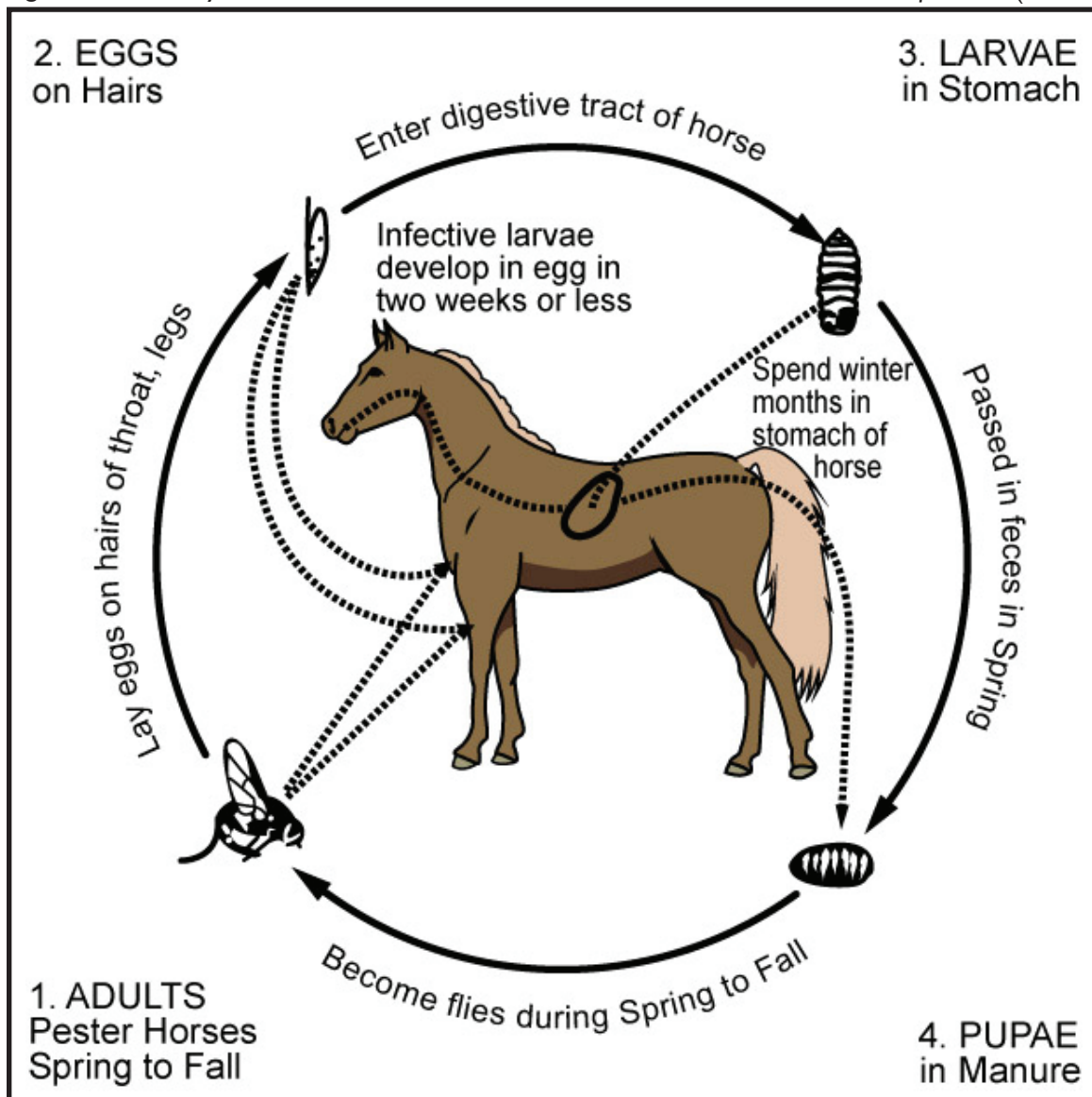
Fraser, Clarence M., ed. *The Merck Veterinary Manual: A Handbook of Diagnosis, Therapy, and Disease Prevention and Control for the Veterinarian*. 7th ed. Rahway, NJ: Merck & Co., Inc., 1991.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

Equine Science

Credit: *Controlling Internal Parasites of Horses (G2854)*

Figure 5.1 - Life Cycles of Botflies



Lesson 6: Hoof Care

The hoof is designed to withstand tremendous amounts of pressure. Normally, it can endure the impacts of walking and running. However, this seemingly indestructible structure can be weakened by something as simple as overeating.

Structures of the Hoof

As the horse is standing, the visible parts of a hoof are the wall, coronary band, perioplic ring, pastern, fetlock, and cannon. (See Figure 6.1.) The hoof wall is made from fibers that grow down from the coronary band (also known as the growth ring). These fibers are parallel to one another. The hoof wall grows approximately 3/8" per month and at a 45-55° angle.

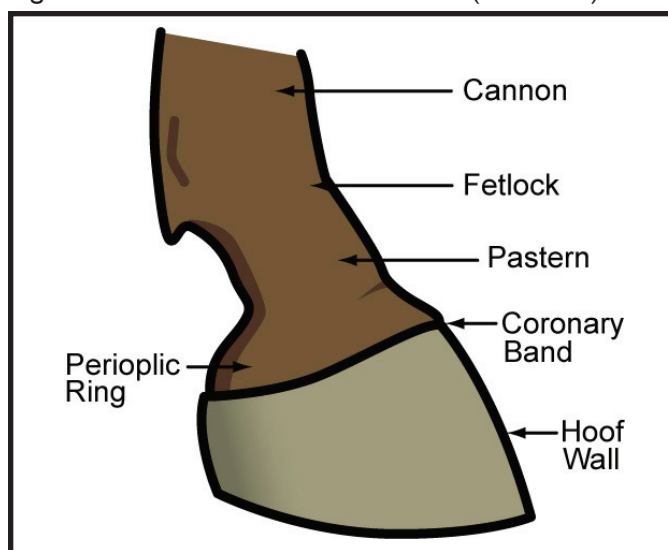
The hoof can be divided into three sections: toe, quarter, and heel. The white line, or inner wall of the hoof, is a softer tissue with a similar cell structure that separates the wall from the sole.

The next structure is the frog. It starts at the heel and projects forward toward the toe in the shape of a V. At the back part of the frog is the extension point known as the cleft of the frog. The frog's major functions are to allow the hoof to expand and to act as a shock absorber. (See Figure 6.2.) The hoof's inner structure is made up of five major bones—the cannon, long and short pasterns, coffin, and navicular. (See Figure 6.3.) These bones are the supporting structures that are responsible for holding the horse's weight. Failure of any one of these bones will cause lameness; if severe enough, it will cause permanent damage.

Inspecting the Hoof

Hoofs should be inspected at regular intervals (daily, if shod). Before and after riding, each hoof should be picked up and cleaned. If the horse is pastured and barefoot, hoofs should be inspected at least twice a week. This assures healthy hoofs and keeps the animal used to having its feet picked up. A person should also be on the lookout for any unusual movements that might indicate lameness. Use extreme care when handling hoofs of a horse that has not been handled that much.

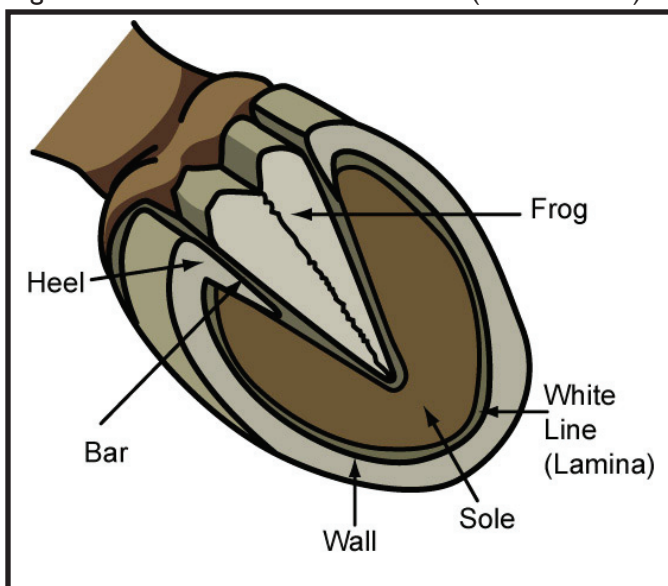
Figure 6.1 - External Parts of the Foot (Side View)



When examining the hoof, the first step is to clear away any mud, manure, or foreign matter stuck to the sole. Take care to clean well around the frog. Never cut down the size of the frog, but remove any dead and loose material around the frog.

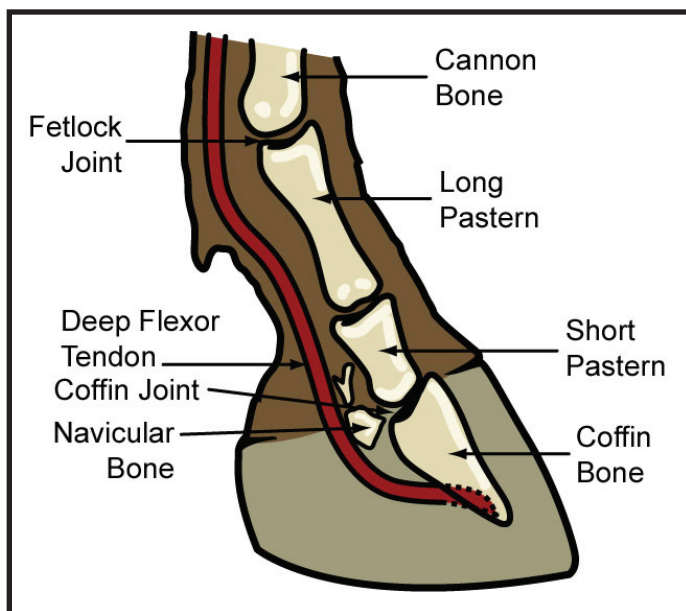
While cleaning out mud and debris, it is usually very easy to tell if the horse has thrush. Thrush is a fungus that creates a very strong, unpleasant odor. If detected, there are several products to treat this condition. One inexpensive treatment is to use a mild solution of bleach water and spray directly on the sole and frog area. Next, check for any chipping or cracking caused from drying out.

Figure 6.2 - External Parts of the Foot (Bottom View)



Equine Science

Figure 6.3 - Internal Parts of the Foot



If drying becomes a problem, apply a hoof dressing such as neat's-foot oil, sweet oil, linseed oil, or another type of dressing. During extreme dry weather, it is a good idea to apply some type of hoof dressing each time the hoofs are cleaned.

Trimming the Hoof

In the wild, horses have very few problems with their feet. However, during domestication, the horse moved away from the naturally soft pasture to hard surfaces; small paddocks; muddy, urine-filled stalls; and unnatural diets. Therefore, people need to trim and care for the horse's hoof. Any shod horse's hoofs should be trimmed and reshod once a month since the hoof grows about $\frac{3}{8}$ " in a month's time. Failure to keep the hoof trimmed can cause excess strain on tendons.

Trimming is not something an amateur should attempt. Done incorrectly, it can cause quicking of the hoof or setting the hoof at the wrong angle. Quicking happens when trimming is done too close to the hoof's quick (similar to the quick on a person's fingernail). It can cause some bleeding and leaves an opening for infection. Nipping involves taking a pair of nippers (like large fingernail clippers) and removing a small portion of the hoof all the way around. Filing consists of taking a large rasp and filing smooth the rough edges. This is done after nipping.

Training from a qualified farrier is a good way to learn hoof trimming for one's own animals.

Ways of Shoeing

Shoeing protects the hoof from excessive wear, provides increased traction when trail riding, and helps correct defects in stance or gait. It also helps correct diseases and defects. Furthermore, shoes can help relieve pain and discomfort from such problems as hoof wall cracks, stone bruises, and tendonitis. However, shoeing does not make walking easier or increase agility. It does increase road shock, and nail holes can weaken the hoof wall or provide an access for germs to enter and cause an infection.

There are two styles of shoeing—hot shoeing and cold shoeing. Hot shoeing involves taking a shoe that has been handmade or commercially made, heating it up, and shaping and sizing it to the hoof's shape. Cold shoeing is simply shaping and sizing the shoe without heat treatment. Whichever method is used, shoeing should only be done by a skilled farrier. If not done properly, it can cause some very serious problems.

A new method called Natural Hoof Care is being used as an alternative to shoeing and as a way to treat horses with hoof abnormalities. This involves careful trimming and exercise to build up the hoof naturally without shoes. Horses were intended to go barefoot everywhere and on any kind of terrain. The natural method of hoof care is intended to bring the hoof back to its ideal shape and form. It can be used to treat several hoof abnormalities.

Hoof Abnormalities

Lameness is simply any condition that affects the horse's feet in an adverse way. Treatment depends on the exact condition. Many things can affect the horse's hoofs; some of these abnormalities follow.

Founder—A serious and common problem is founder (or laminitis), which affects about 100,000 horses a year. It is a breakdown between the soft tissue of the laminae and the hard outer wall of the hoof. It can be brought on by a number of causes, such as overeating grain, lush legumes or grasses (rich in carbohydrates); watering while the horse is hot; or because of uterus inflammation after

foaling. Treatment for this condition varies, depending on the severity. Regardless, treatment should be immediate to reduce the risk of permanent damage or death.

Stone bruise – Another common problem is stone bruising. Frequently, a bruise to the sole of the hoof is caused by a hard object (usually a stone or chunk of frozen soil). The main concern is that the injury does not form an abscess and cause further complications. Treatment is to let the animal rest and not use the hoof any more than necessary. If an abscess does develop, a veterinarian should be called.

Naviculitis – Naviculitis (navicular disease) is a disease of the navicular bone and bursa in the front feet. In some cases, the bone can rotate downward. (See Figure 6.4.) The cause may be difficult or even impossible to determine, and treatment will vary from animal to animal. Some animals may respond to corrective shoeing, while others may require therapy by a veterinarian. In most cases, recovery is limited.

Thrush – One of the most preventable diseases a horse can contract, thrush is caused by an anaerobic bacterium that grows around the frog of the hoof, causing a foul odor. The main cause of thrush is unsanitary stall conditions—wet and urine-soaked bedding—that the horse is left to stand in for extended periods of time. Treatment is to first clean the stall and keep it clean. Treat the affected hoof with a disinfectant-like bleach, iodine, copper sulphate, or copper naphthenate.

Hoof cracks—Also known as quarter cracks and toe cracks, these vertical cracks develop in the hard, outer surface of the hoof and vary in length. The cause is usually from the hoof becoming too dry or from improper shoeing. The treatment is to use special shoes that protect the hoof and prevent it from cracking further. Another treatment is to file or burn the top of the crack with a hot bar in a half-moon shape. Prevention includes applying some type of hoof dressing or, during very dry weather, moistening the soil around watering troughs.

Summary

The horse's hoof is a complex structure that can withstand the pressures of walking and running. However, the horse's hoof can be damaged relatively easily through improper care by its owner or handler. An animal's health depends greatly on the condition of its feet.

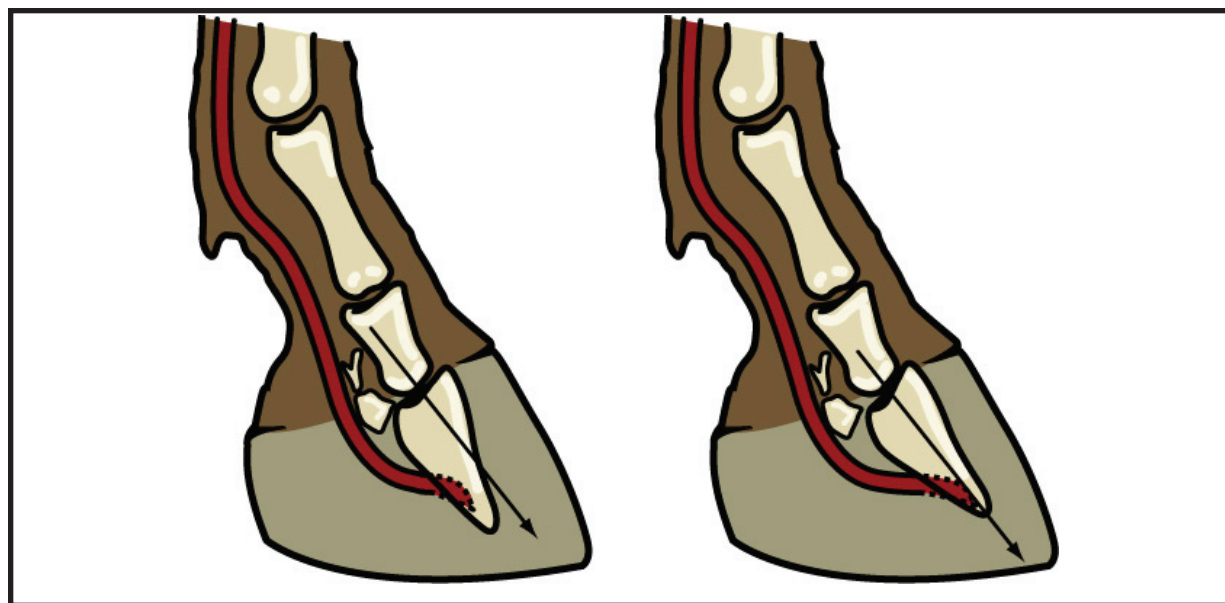
Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Fraser, Clarence M., ed. *The Merck Veterinary Manual: A Handbook of Diagnosis, Therapy, and Disease Prevention and Control for the Veterinarian*. 7th ed. Rahway, NJ: Merck & Co., Inc., 1991.

Harper, F. *Top Form Book of Horse Care*. New York: Popular Library, 1971.

Figure 6.4 - Rotated Bone Versus Normal Bone



Equine Science

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

Horse Safety: Catching, Leading and Grooming (G2880). University of Missouri-Columbia: Extension Division, 1993.

OSU Extension Facts No. 9115. Stillwater, OK. Division of Agricultural Science and Natural Resources, Oklahoma State University, 1990.

Lesson 7: Nutrition

Providing a properly balanced ration is vital for care of the horse. Grain and hay must be clean and free from dust and molds. It is important to understand how the horse's digestive tract uses the nutrition that is provided.

Anatomy of the Simple Digestive Tract

Horses differ from cattle in that a cow has a four-chambered stomach, while the horse has only one. The horse's stomach holds about 8-16 quarts, depending on the size of the animal. Feed that is taken into the stomach

passes through it very quickly, and not much digestion or absorption takes place in the stomach.

The horse's digestive system consists of the following organs: mouth, esophagus, simple stomach, small intestine, cecum, large intestine, colon, and rectum. The mouth is responsible for taking in and chewing (masticating) the feed; this is where digestion begins. The mouth also adds saliva to the feed to allow it to pass down the esophagus, which is the next organ in the digestive tract. The esophagus transports feed from the mouth to the stomach. After leaving the stomach, feed passes into the small intestine, which is about 70 feet long. To aid in the break down of the feed, enzymes are added from the

Table 7.1 - Light Horse Feeding Guide¹

Credit: *Horses and Horsemanship*, p. 218. Used with permission.

Age, sex, and use	Daily allowance	Kind of hay
Stallions in breeding season (weighing 900-1,400 lb.)	3/4-1 1/2 lb. grain per 100 lb. body weight, together with a quantity of hay within same range	Grass-legume mixed; or 1/3-1/2 legume hay, with remainder grass hay
Pregnant mares (weighing 900-1,400 lb.)	3/4-1 1/2 lb. grain per 100 lb. body weight, together with a quantity of hay within same range	Grass-legume mixed; or 1/3-1/2 legume hay, with remainder grass hay (Straight grass hay may be used in the first half of pregnancy.)
Foals before weaning (weighing 100-350 lb. with projected mature weights of 900-1,400 lb.)	3/4-1 1/2 lb. grain per 100 lb. body weight, together with a quantity of hay within same range	Legume hay
Weanlings (weighing 350-450 lb.)	1-1 1/2 lb. grain and 1 1/2-2 lb. hay per 100 lb. body weight.	Grass-legume mixed; or 1/2 legume hay, with remainder grass hay
Yearlings, second summer (weighing 450-700 lb.)	Good, luxuriant pastures. (If in training for other reasons without access to pastures, the ration should be intermediate between the adjacent upper and lower groups.)	
Yearlings, or rising 2-year-olds, second winter (weighing 700-1,000 lb.)	1/2-1 lb. grain and 1-1 1/2 lb. hay per 100 lb. body weight.	Grass-legume mixed; or 1/3-1/2 legume hay, with remainder grass hay
Light horses at work; riding, driving, and racing (weighing 900-1,400 lb.)	<ul style="list-style-type: none"> • Hard use—1 1/4 - 1 1/3 lb. grain and 1-1 1/4 lb. hay per 100 lb. body weight • Medium use—3/4-1 lb. grain and 1-1 1/4 lb. hay per 100 lb. body weight • Light use—2/5 - 1/2 lb. grain and 1 1/4-1 1/2 lb. hay per 100 lb. body weight 	Grass hay
Mature idle horses; stallions, mares, and geldings (weighing 900-1,400 lb.)	1 1/2-1 3/4 lb. hay per 100 lb. body weight	Pasture in season; or grass-legume mixed hay

¹ With all rations and for all classes and ages of horses, provide free access to a mineral box as follows: (1) Where the pasture or hay is primarily grass, use a mixture containing 2 parts of calcium to 1 part of phosphorus; and (2) where the pasture or hay is primarily a legume, use a mixture containing 1 part of calcium to 1 part of phosphorus. To each of these mixes, add 1/3 salt (trace mineralized) to improve acceptability. If preferred, a good commercial mineral can be used. Self-feed salt separately.

Equine Science

liver and the pancreas. At the site where the large and small intestines meet, the cecum is connected. It is about 4 feet long and about one foot in diameter, which is much larger than that of a cow's, pig's, or human's. The cecum is also called the water gut. In the horse, it is where digestion (fermentation) continues and nutrients that are ready for absorption are absorbed.

After feed passes from the cecum, it goes through the large intestine, where more absorption takes place. In the colon, moisture from the feed is removed and the undigested feed is balled up and excreted through the rectum.

Colic

Colic is a generic term that simply means abdominal discomfort. This can be severe and even fatal for the horse. The horse's stomach is designed to take in feed frequently in small quantities. In the wild, the horse eats at an almost continual rate. Because of the horse's domestication, it does not always get the chance to eat as it would in the wild, and overfeeding is the main cause of colic. People feed the horses two or three larger meals, which sometimes causes intestines to become blocked (impacted). This can be serious or even fatal, if not promptly treated by a veterinarian.

Nutritional Requirements of the Horse

Each horse has different needs, depending on the size, age, and activity level (work load) of the horse. Other factors that affect nutritional requirements are breeding, location, weather conditions, stress, and quality of feed. Table 7.1 shows the recommended nutritional requirements of the different light horses.

Factors Affecting Digestion

In the horse, it takes about 24 hours to completely empty the stomach, as compared to the cow's, which takes about 72 hours. Outside factors influence this rate of digestion, such as stress, body condition, or feed quality. If a horse is being worked or becomes frightened, digestion slows down or may even stop temporarily. The horse processes much of its food in the cecum. The horse's simple digestive system does not break down as much food as a cow's (about 30 percent, compared to about 70 percent).

The Importance of Water

Of all the nutrients required by the horse, the cheapest and most important one is water. The horse can go much longer without feed than it can without water. If a horse lost only 20 percent of its body's water from dehydration, it would die. Water is necessary for the production of saliva, cell formation within the body's organs, as a medium to carry nutrition to the body's cells, temperature control, lubrication, and in chemical reactions.

In cool weather, a horse drinks approximately 0.5 gallons of water per hundred-weight daily. In hot weather, when working hard and when nursing, a horse needs about 1.5 gallons of water daily. Give the horse free access to clean water. However, do not let a horse drink heavily after or before doing heavy work or exercise, as this can cause foundering. Keep water fresh, cool in the summer, and about 40 degrees F in the winter.

Feed Types

There are many different types of feed available. They are grouped as grains, roughage, supplements, minerals, and vitamins. The one constant is that they all must be clean and free from dust and molds. The feed used will depend on cost, availability, and owner personal preferences. The most common grains fed to horses are oats and corn.

Many people buy feed that has been premixed with added vitamins and minerals. This has some advantages and some disadvantages. An obvious advantage is one of convenience. Many owners who have only a few animals do not have the equipment or storage facilities to mix their own rations. Another advantage is that they do not have to buy large quantities, so there is less money tied up in feed. Disadvantages are that they cannot control the exact amounts of ingredients in the ration, and premixed feed is more expensive to buy.

Hay needs to be clean and free from dust and molds, which may cause a horse to colic. Along with its grain, a horse only needs about 1 percent of its body weight in roughage per day. (See Table 7.1.)

In addition to the ration, horses should have access to a mineral box with either loose or block mineral. These

mineral feeders are usually freely available and are a combination mineral-vitamin-salt blocks.

The important thing is that all horses are different and will require different amounts of feed. All feed charts are meant to be used as guides when choosing a feed. Horses should be fed and watered, if water is not given free choice, at about the same time each day. It is important to avoid sudden changes in feed type or amount to avoid problems with colic or founder.

Determining What Feeds Are Used

The feed type used is decided by cost and availability. In some areas, certain feeds are not grown, and they are unavailable or too expensive to be practical. Medical condition is one factor affecting feed choice. After a horse has had colic, a veterinarian might put it on a bran mash until it has recovered. Likewise, if a mare is in heavy lactation, she may be put on a high protein diet.

Nutrition-Related Problems

There are many nutrition-related problems that a horse can experience. Probably the most common and serious two are colic and founder (laminitis). Both cause millions of dollars in losses yearly and are probably preventable in most cases. (See Lesson 5 for more on colic; review Lesson 6 for more information on founder.)

Epiphysis is a nutritional disease that sometimes affects young horses. It involves swelling around the growth plates of the long leg bones; the cause is believed to be malnutrition.

Vitamins are very important for good health and should be included in the horse's ration. For example, a lack of Vitamin D can cause rickets. However, overfeeding vitamins can be as harmful as the lack of vitamins. (Refer to Table 7.3.)

Horses can develop nutritional problems by ingesting toxic plants in their hay or in the field. It is a good idea to find out what plants grow in the area in order to get rid of any that could be harmful. Table 7.2 lists poisonous plants found in temperate North America; consult an Extension agent to help identify these plants.

Table 7.2 -
Toxic Plants

Acorns
Bracken fern
Dallis grass
Hairy vetch
Horsetail
Locoweed
Nightshade
Oak
Onion
Red maple
Sorghum/Sudan
Sweet clover
Yellow star thistle

There are many other types of plants that can be toxic to the horse. Contact the veterinarian or Extension agent to find out what plants are a problem in the area.

One toxicity problem horses have is with alfalfa hay infested with blister beetles. These beetles contain a substance called cantharis. This toxin is very irritating to the horse's intestines, and if the horse eats enough of them, it can cause death. In areas that have problems with blister beetles, all hay should be checked for signs of the beetles.

Tying up syndrome is also called Monday morning sickness or azoturia. Symptoms include rapid pulse, sweating, muscle stiffening (especially in the hindquarters). The exact cause is unknown. Tying up is usually associated with heavy exercise followed by a rest period, during which high-energy feed is fed. In severe cases, permanent lameness can result. To lessen the chances of tying up, limit the amount of high-energy feed during rest periods. Treatment involves keeping the animal quiet, sheltered, and standing until a veterinarian can examine it.

Summary

In the wild, the horse was able to take care of all its needs and usually had few problems. The domesticated horse depends on people to provide all its nutritional needs. It is the responsibility of the owner to make sure the horse has the proper nutrition at all times.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Equine Science

Table 7.3 - Horse Vitamin Chart

Credit: *Horses and Horsemanship*, pp. 194–199. Used with permission.

Vitamins which may be deficient under normal conditions				
Conditions usually prevailing where deficiencies are reported		Function of vitamin	Some deficiency symptoms	Practical sources of the vitamin
Fat-soluble vitamins:				
A	<ul style="list-style-type: none"> Extended drought, bleached hays. Stall feeding where there is little or no green forage or yellow corn. Following great stress, as when race or show horses are put in training. The younger the animal, the quicker vitamin A deficiencies will show up. Mature animals may store sufficient A to last 6 months. 	<ul style="list-style-type: none"> Promotes growth and stimulates appetite. Assists in reproduction and lactation. Keeps the mucous membranes of respiratory and other tracts in healthy condition. Makes for normal vision. Prevents night blindness. 	Loss of appetite, poor growth, reproductive problems, nerve degeneration, night blindness, lachrymation (tears, keratinization of the cornea and skin, uneven and poor hoof development, a predisposition to respiratory infection, incoordination, progressive weakness, convulsive seizures, certain bone disorders, and finicky appetite.	<ul style="list-style-type: none"> Stabilized vitamin A. Green grass. Green grass or legume hay not more than 1 year old. Carrots, yellow corn.
D	Limited sunlight and/or limited sun-cured hay, especially when the horse is kept inside most of the time.	Assimilation and utilization of calcium and phosphorus, necessary in normal bone development—including the bones of the fetus.	<ul style="list-style-type: none"> Rickets in foals, osteomalacia in mature horses. Both conditions result in large joints and weak bones. Rickets is characterized by reduced bone calcification, stiff and swollen joints, stiffness of gait, irritability, and reduction in serum calcium and phosphorus. Osteomalacia results in bones which soften, become distorted, and fracture easily. 	<ul style="list-style-type: none"> Either vitamin D₂ (the plant form) or D₃ (the animal form is equally effective for the horse). Exposure to sunlight. Sun-cured hays.
E	More vitamin E may be destroyed or used by horses during times of stress or strain than can be obtained through normal feeds.	<ul style="list-style-type: none"> As an antioxidant. As an occasional replacement for selenium. Improves reproduction. Prevents anhidrosis. 	<ul style="list-style-type: none"> Lowered breeding performance in both mares and stallions. Anhidrosis—a dry, dull hair coat; elevated temperature; and high blood pressure. Anhidrosis has been successfully treated by the oral administration of 1,000–3,000 IU of vitamin E daily. 	<ul style="list-style-type: none"> Alpha-tocopherol acetate, a stable form of vitamin E. Wheat germ meal and wheat germ oil. Green plants. Green hays.
K	Following intestinal disorders.	Concerned with blood coagulation. It converts precursor proteins to the active blood clotting factors.	Increased clotting time of the blood and lowered level of prothrombin.	<ul style="list-style-type: none"> Green pasture. Well-cured hays. Cereal grains. Milk. Menadione (vitamin K₃).
Water-soluble vitamins:				
Biotin	Sulfa drugs kill intestinal organisms; hence, when they are used an extended period, there may be a deficiency of biotin.	Biotin play an important role in the metabolism of carbohydrates, fats, and proteins.	In all animals, a deficiency of biotin will depress growth and cause a loss of hair and/or a dermatitis.	Alfalfa hay, blackstrap molasses, cottonseed meal, soybean meal, peanut meal, milk, wheat bran, synthetic biotin, and yeast (brewers', torula).
Choline	Ration low in methionine, an amino acid.	Prevention of fatty livers, the transmitting of nerve impulses, and the metabolism of fat.	Slow growth and fatty livers are the deficiency symptoms.	<ul style="list-style-type: none"> Feed sources, such as alfalfa hay, blackstrap molasses, and cereal grains. Body manufacture of choline from excess of the amino acid methionine. Choline chloride. Choline dihydrogen.
Folacin (Folic Acid)		In all vertebrates, folacin is essential for normal growth and reproduction, for the prevention of blood disorders, and for important biochemical mechanisms in each cell.	<ul style="list-style-type: none"> Poor growth. Anemia. 	<ul style="list-style-type: none"> Alfalfa hay, the oil meals (soybean, cottonseed, and linseed), skimmed milk, and wheat and wheat by-products. Synthetic folacin, wheat germ, and yeast (brewers', torula).

Classes/Function	Nutrient requirements ^{1 2}			Nutrient allowances ^{1 2}			Comments
	Per horse daily	In ration A-F	Per ton ration A-F	Per horse daily	In ration A-F	Per ton ration A-F	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	(IU)	(IU/lb.)	(IU/ton)	(IU)	(IU/lb.)	(IU/ton)	<ul style="list-style-type: none"> Vitamin A is not synthesized in the cecum. Hay more than 1 year old, regardless of green color, is usually not an adequate source of carotene or vitamin A activity. When deficiency symptoms appear, add stabilized vitamin A to the ration. It is wasteful to feed more vitamin A than is needed. Also, exceedingly high levels more than an extended period of time may cause bone fragility, hyperostosis, and exfoliated epithelium.
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	22,725	909	1,818,000	26,134	1,045	2,090,700	
	34,100	1,364	2,728,000	39,215	1,569	3,137,200	
	10,908	909	1,818,000	12,544	1,045	2,090,700	
	22,725	909	1,818,000	26,134	1,045	2,090,700	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	3,400	136	272,000	3,910	156	312,800	<ul style="list-style-type: none"> The requirement is less when a proper balance of calcium and phosphorus exists in the ration. When animals are exposed to direct sunlight, the ultraviolet light produces vitamin D from traces of cholesterol in the skin. Stabled horses exercised in the early morning will not get sufficient vitamin D. Too much vitamin D may harm a horse. Toxicity is characterized by calcification of the blood vessels, heart, and other soft tissues, and by bone abnormalities. A toxic level of vitamin D has not been established in the horse, but a level 50 times the requirement may be harmful.
	6,825	273	546,000	7,849	314	627,900	
	4,368	364	728,000	5,023	419	837,200	
	3,400	136	272,000	3,910	156	312,800	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	575	23	46,000	661	26	52,900	Utilization of vitamin E is dependent on adequate selenium.
	900	36	72,000	1,035	41	82,800	
	432	36	72,000	497	41	82,800	
	900	36	72,000	1,035	41	82,800	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	(mg)	(mg/lb.)	(mg/ton)	(mg)	(mg/lb.)	(mg/ton)	<ul style="list-style-type: none"> High levels of vitamin K will overcome bleeding due to dicoumarol. Vitamin K is generally (1) widely distributed in normal feeds, and/or (2) synthesized in adequate amounts by the intestinal microflora of the horse.
				8.0	0.32	640	
				8.0	0.32	640	
				3.6	0.30	600	
				8.0	0.32	640	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				2.5	0.1	200	Biotin is closely related metabolically to folacin, pantothenic acid, and vitamin B-12.
				2.5	0.1	200	
				1.2	0.1	200	
				2.5	0.1	200	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				500	20.0	40,000	Choline content of normal feeds is usually sufficient.
				750	30.0	60,000	
				750	62.5	125,000	
				750	30.0	60,000	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				20	0.8	1,600	Folacin is widely distributed in horse feeds. Also, folacin is synthesized in the lower gut.
				30	1.2	2,400	
				36	3.0	6,000	
				30	1.2	2,400	

Equine Science

Vitamins which may be deficient under normal conditions				
Conditions usually prevailing where deficiencies are reported		Function of vitamin	Some deficiency symptoms	Practical sources of the vitamin
Fat-soluble vitamins:				
Niacin (Nicotinic Acid, Nicotinamide)		Constituent of two important coenzymes. They are involved in the release of energy from carbohydrates, fats, and proteins, and in the synthesis of fatty acids, protein, and DNA.	<ul style="list-style-type: none"> • Reduced growth and appetite. • Skin rashes, diarrhea, nerve disorders. 	<ul style="list-style-type: none"> • Green alfalfa. • Niacin is widely distributed in feeds; fermentation solubles and certain oil meals are especially good sources. • Synthetic niacin.
Pantothenic Acid (Vitamin B-3)		Part of coenzyme A, which plays a key role in body metabolism.	Poor growth, skin rashes, poor appetite, nervous disorders.	<ul style="list-style-type: none"> • Safflower meal, blackstrap molasses, wheat bran, and milk. • Calcium pantothenate.
Riboflavin (Vitamin B-2)	When green feeds (pasture, hay, or silage) are not available.	Riboflavin has an essential role in the oxidative mechanisms of the cells.	<ul style="list-style-type: none"> • Periodic ophthalmia (or moon blindness), characterized by catarrhal conjunctivitis in one or both eyes, accompanied by photophobia, and lachrymation. • Decreased rate of growth and feed efficiency. • Porous and weak bones; ligaments and joints impaired. 	<ul style="list-style-type: none"> • Green pasture. • Green hay. • Milk and milk products. • Synthetic riboflavin. • Yeast.
Thiamin (Vitamin B-1)	<ul style="list-style-type: none"> • Poor-quality hay and grain. When sulfa drugs or antibiotics are given to the horse, the synthesis of B vitamins is impaired. • Consumption of bracken fern (<i>Pteris aquilina</i>) and horsetail (<i>Equisetum spp</i>) will cause thiamin deficiency due to the antithiamin compounds that they contain. 	<ul style="list-style-type: none"> • In energy metabolism. Without thiamin, there would be no energy. • In the working of the peripheral nerves. • Promotes appetite and growth. 	<ul style="list-style-type: none"> • A thiamin deficiency has been produced experimentally. • Decreased feed consumption (loss of weight), anemia, incoordination (especially in the hindquarters), lowered blood thiamin, elevated blood pyruvic acid, enlarged heart, and nervous symptoms. 	<ul style="list-style-type: none"> • Wheat and wheat by-products. • Oilseed meals. • Oat grain and groats. • Thiamin hydrochloride. • Yeast (brewers', torula).
Vitamin B-6 (Pyridoxine, Pyridoxal, Pyridoxamine)		In its coenzyme forms, it is involved in a large number of physiologic functions, particularly protein, carbohydrate, and fat metabolism.	No deficiency symptoms of vitamin B-6 have been reported in the horse. So, it is thought to be synthesized in the cecum.	Green pasture, alfalfa hay, wheat bran, wheat germ, and yeast (brewers', torula).
Vitamin B-12 (Cobalamins)	<ul style="list-style-type: none"> • When few, or no feeds of animal origin are fed. • Where cobalt is not present in the feed, thereby precluding the synthesis of vitamin B-12 in the gastrointestinal tract. 	<ul style="list-style-type: none"> • Coenzyme in several enzyme systems. • Closely linked with choline, folacin, and pantothenic acid. 	Loss of appetite and poor growth.	<ul style="list-style-type: none"> • Protein supplements of animal origin. • Fermentation products. • Cobalamins, yeast.
Vitamin C (Ascorbic Acid, Dehydroascorbic Acid)	The vitamin C requirements of fish and humans have been observed to increase in periods of stress. It is conjectured that heavily stressed horses may require more vitamin C than they can synthesize.	<ul style="list-style-type: none"> • Formation and maintenance of collagen. • More rapid healing of wounds. • Sound bones. 	No deficiency symptoms in horses noted. ¹ In humans and monkeys, scurvy is the main deficiency symptom. In humans, sudden death from severe internal hemorrhage and heart failure is always a danger.	<ul style="list-style-type: none"> • Ordinary rations and body synthesis provide adequate vitamin C for horses. • Well-cured hays and green pastures are good sources of vitamin C.
Unidentified Factors	Since the U.S. foal crop is only around 50 percent, it is obvious that there is room for improvement, and perhaps unidentified factors are involved. Also, optimal results with horses during the critical periods (growth, gestation-lactation, and when under stress as in racing or showing) appear to be dependent upon providing unidentified factors through such ingredients as distillers' dried solubles, dehydrated alfalfa meal, condensed fish solubles, brewers' dried yeast, antibiotic fermentation residues, dried whey, and corn fermentation solubles.			

² Feed consumption of mature 1,000 lb (454 kg) horse estimated at 25 lb. (11.36 kg) per day. Feed consumption of a 450 lb. (204.5 kg) weanling is estimated at 12 lb. (5.45 kg) per day.

Classes/Function	Nutrient requirements ^{1 2}			Nutrient allowances ^{1 2}			Comments
	Per horse daily	In ration A-F	Per ton ration A-F	Per horse daily	In ration A-F	Per ton ration A-F	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	(IU)	(IU/lb.)	(IU/ton)	(IU)	(IU/lb.)	(IU/ton)	<ul style="list-style-type: none"> • There is some evidence that niacin is synthesized by the horse. • The horse can convert the essential amino acid tryptophan into niacin. Hence, it is important to make certain that the ration is adequate in niacin; otherwise, the horse will use tryptophan to supply niacin needs.
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				250	10.0	20,000	<ul style="list-style-type: none"> • Grain is very deficient in pantothenic acid. • Of all the B vitamins, pantothenic acid is most likely to be deficient under stable (confinement) conditions.
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	22.8	0.91	1,820	40.0	1.6	3,200	Lack of vitamin B-2 is not the only cause of moon blindness. Sometimes, moon blindness follows leptospirosis, and it may be caused by an allergic reaction.
	22.8	0.91	1,820	40.0	1.6	3,200	
	10.9	0.91	1,820	19.2	1.6	3,200	
	22.8	0.91	1,820	40.0	1.6	3,200	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse	34.1	1.36	2,720	39.2	1.57	3,140	<ul style="list-style-type: none"> • Thiamin is synthesized in the lower gut of the horse by bacterial action, but there is some doubt as to its sufficiency. • When neither green pasture nor high-quality roughage is available, thiamin hydrochloride should be added to the ration. • Since carbohydrate metabolism is increased during physical exertion, it is important that B-1 be available in quantity at such times.
	34.1	1.36	2,720	39.2	1.57	3,140	
	16.4	1.36	2,720	18.9	1.57	3,140	
	56.8	2.27	4,540	65.3	2.61	5,220	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				25.0	1.0	2,000	Normally, horse rations contain adequate vitamin B-6. Also, it appears to be synthesized in the cecum. Yet, these sources may not be adequate for the maximum performance of the horse.
				25.0	1.0	2,000	
				6.0	0.5	1,000	
				25.0	1.0	2,000	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				0.125	0.005	10	It is reported that horses in poor nutritional condition showing anemia respond to the administration of vitamin B-12.
				0.150	0.006	12	
				0.084	0.007	14	
				0.150	0.006	12	
Maintenance: 1,000 lb. (454 kg) horse Gestation/Lactation: 1,000 lb. (454 kg) mare Growth: 450 lb. (204.5 kg) weanling Working: 1,000 lb. (454 kg) horse				60	2.4	4,800	Dietary need is clearly evident for humans, monkeys, guinea pigs, fruit-eating bats, and bulbul birds. However, vitamin C is probably required by other species, but synthesized in the body; the only question is whether the horse can synthesize enough vitamin C when under stress.
				100	4.0	8,000	
				45	3.75	7,500	
				100	4.0	8,000	

¹ As used herein, the distinction between "nutrient requirements" and "nutrient allowances" is as follows. In nutrient requirements, no margins of safety are included intentionally, whereas in nutrient allowances, margins of safety are provided in order to compensate for variations in feed composition, environment, and possible losses during storage or processing. The nutrient requirements in this table were adapted by the authors from *Nutrient Requirements of Horses*, 5th rev. ed., NRC-National Academy of Sciences, 1989. The nutrient allowances were developed by the author; based on experiments and experiences; it is intended that they are meet the nutrient requirements and provide adequate margins of safety, in addition.

Lesson 8: Equipment and Facilities

With horses, having good equipment and facilities is a must, given the horse's strength. Buildings provide a safe environment from the elements and pests, along with providing a place to care for sick or injured animals. Using equipment that is in poor condition can result in injury to the horse and/or the handler.

Types and Uses of Tack

Tack comes in many varieties and generally refers to any equipment that is used during riding or handling. Styles of tack include Western, English, show, and work. The type of tack used will depend on what the rider wants to accomplish. For example, if one is working cattle, a show saddle is not appropriate.

The halter and bridle are tack that a rider/handler uses to communicate with the horse and give directions. The halter is simply a bridle that doesn't have a bit connected to it. (See Figure 8.1.) A halter can be made out of nylon webbing, rope, or leather. Each material has advantages and disadvantages. The rope halter is inexpensive and easily made, but easier for the horse to break. Nylon halters are more expensive than rope halters but are stronger and easier to find. The leather halter is the most expensive but also the most attractive and is used when showing.

A bridle's main function is to hold the bit in the horse's mouth, which transmits commands from the rider. There are two main types of bridles—Western and English. (See

Figure 8.2.) There are many variations of both and many different types of bits that can be used.

The saddle is the next piece of tack. (See Figure 8.3.) There are two main styles—Western and English. The main difference between the two saddles is that the Western saddle has a high pommel and cantle, and the English saddle looks almost flat. The Western saddle was designed for use by cowboys as they worked and roped cattle.

Figure 8.2 - Bridle Nomenclature and Adjustment Points

Credit: *Choosing, Assembling, and Using Bridles (G2845)*

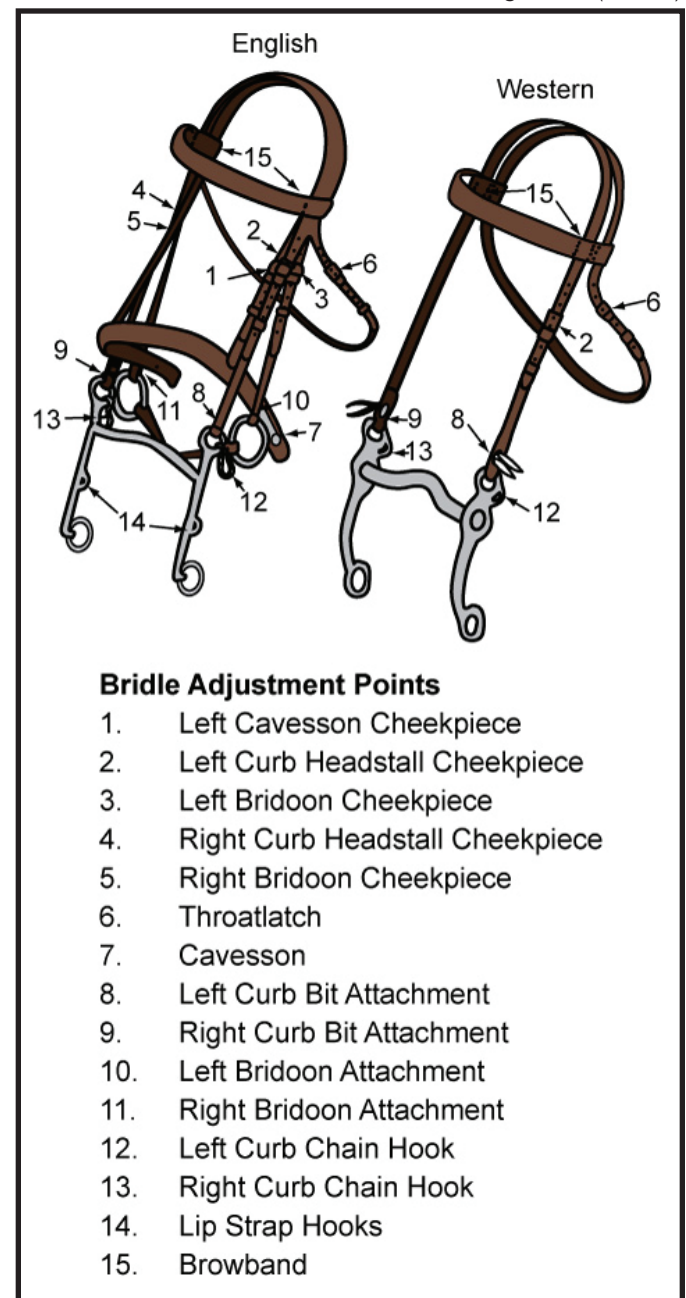
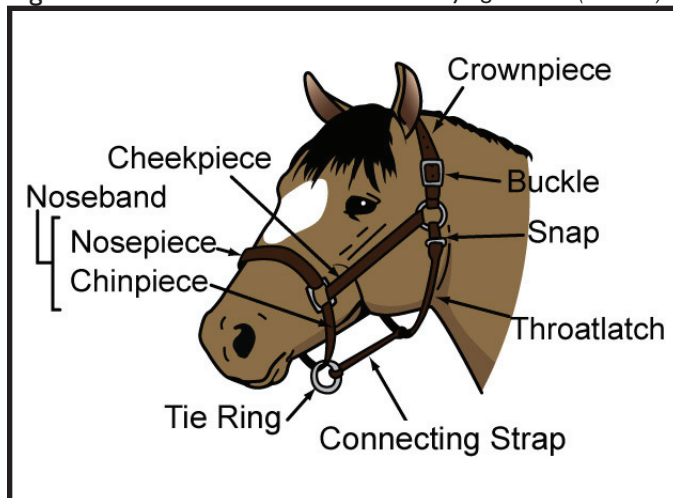


Figure 8.1 - Halter

Credit: *Haltering and Tying Horses (G2844)*



Equine Science

A saddle pad goes between the horse's back and the saddle to protect the horse from the rubbing of the saddle as the horse moves. Saddle pads come in several sizes and thicknesses; the one chosen will depend on the specific saddle.

Blankets are used to cover a horse in the winter on cool nights if the horse has been sweating from exercise. This lessens the chance of a horse catching cold or coming down with pneumonia.

There are many different accessories that can be used when riding for pleasure or when working cattle. Some accessories most commonly used are chaps, which are made out of leather and protect the rider's legs; spurs, which attach to a boot's heel and help give commands to the horse; and splints, which go on the horse's front legs to protect it from injury. Some horse owners will need a harness also. (See Figure 8.5.)

Adjusting Tack

The size of the horse is the deciding factor for choosing appropriate equipment. It is very important that all tack be properly fitted to the horse. If the bridle is too loose, the rider might not be able to get the horse to respond and might lose control. If it is too tight, it can injure the

horse. A properly adjusted bridle will only cause one or two wrinkles in the corners of the horse's mouth.

The throat latch strap should be adjusted to allow two or three fingers between it and the horse's jaw. If the throat latch is too small, it will restrict the horse's head and could interfere with breathing.

The saddle should be of proper size for the horse and rider. The saddle blanket should fit the saddle. Before saddling a horse, make sure that the horse's back and girth (mid-section) are clean, as well as the girth strap and saddle blanket. The girth strap should be tightened firmly, but the gullet (the underside of the pommel) should not rub the horse's wither (front shoulders).

Equipment adjustment will vary, depending on the style of equipment used.

Bits and How They Work

Bits are the mechanical means from which cues are communicated to the horse from the rider. There are various types of bits, and the ones used will depend on the horse and the style of riding. Some of the more common bits are snaffle, curb, pelham, rearing, hackamore, and bosal. Bits act on pressure points on the horse's head,

Figure 8.3 - Saddle Styles

Credit: *Equine Management and Production*, pp. H1-5. Used with permission.

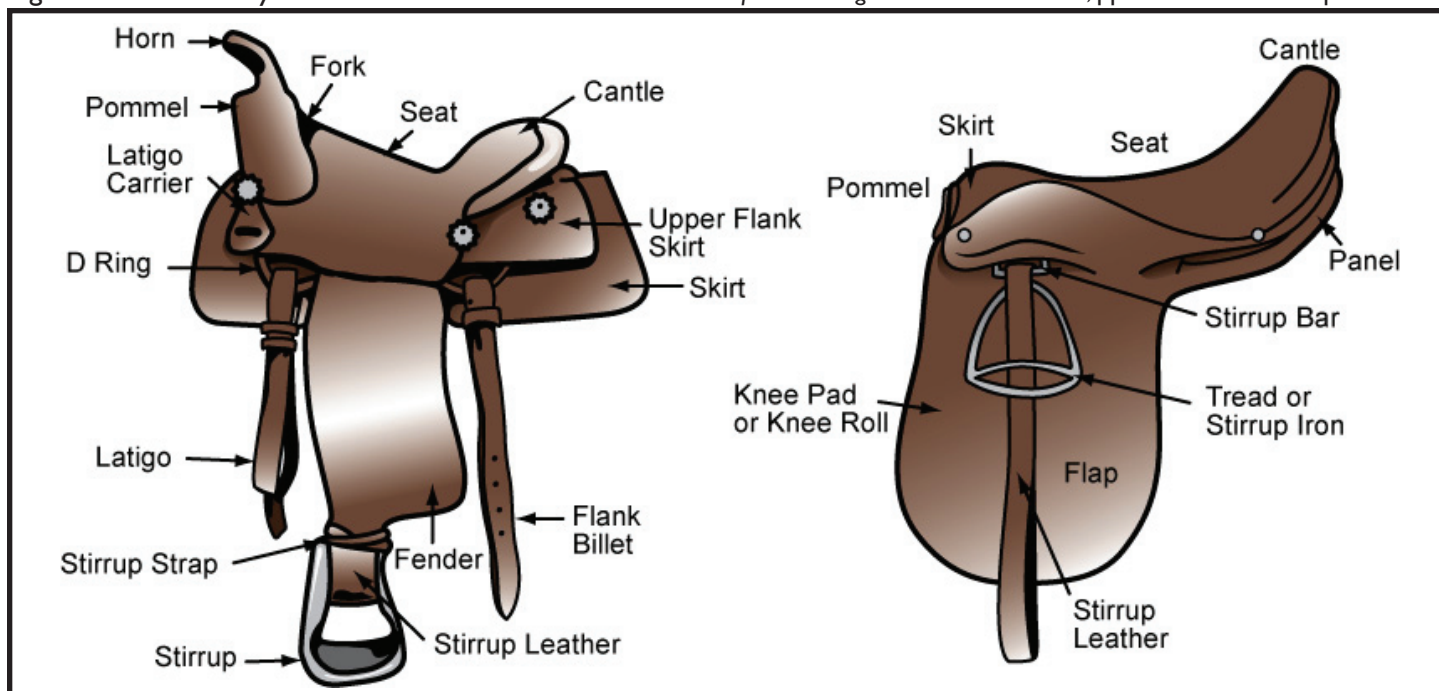
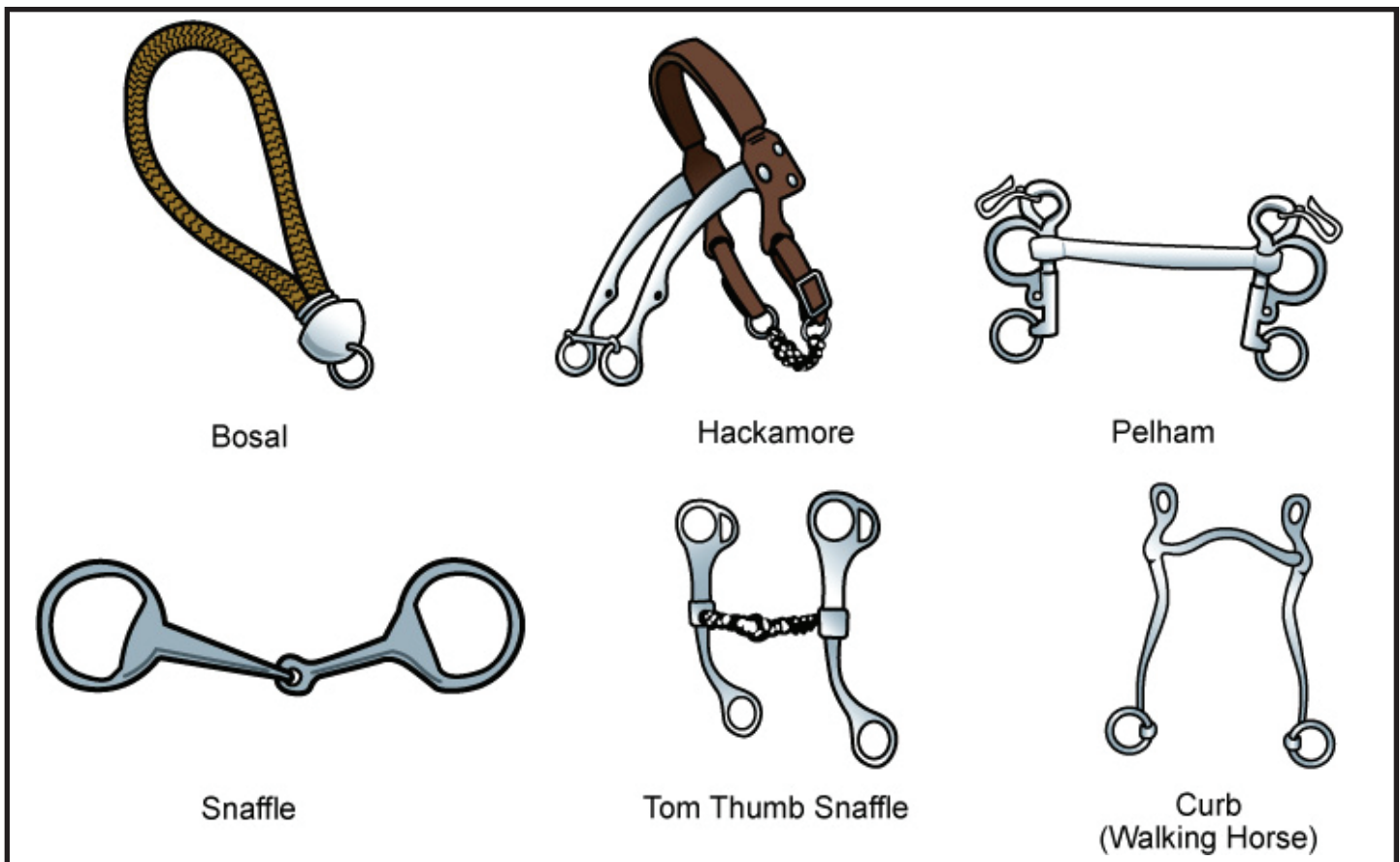


Figure 8.4 - Types of Bits



such as the poll, nose, lips, chin, tongue, and the roof of the mouth.

The snaffle bit is a mouthpiece with a ring at each end where the reins attach. When the rider pulls on the reins, it puts direct pressure on the corner of the horse's mouth. The smaller the diameter of the mouthpiece, the harsher the bit is. The snaffle bit can be a solid piece or a piece that is jointed in the middle. Some will have a cheek piece to prevent the bit from being pulled through the horse's mouth. (See Figure 8.4.)

Curb bits have shanks that act as levers. Pressure is applied to the tongue, bars, corners, and roof of the mouth. The bit rests on the bars of the mouth. (Bars are the spaces on the gums between front and rear teeth.) The longer the shank, the more leverage and the harsher the bit. Curb bits can also have curb chains on them, which exert more pressure in the horse's mouth. Curb bits can have straight or jointed mouthpieces. Some bits have an extra loop extending upward called a spade, which exerts pressure to the roof of the mouth.

The pelham bit is a curb bit with two sets of reins and is used in English style riding. This bit gives more control than snaffle or curb bits.

The hackamore has no mouthpiece—just a head stall and chin strap. It is used frequently by trainers on young horses. This prevents injuring the sensitive mouth of a young horse.

A bosal or bosal hackamore is very similar to the hackamore, except that the bosal has no chains or metal parts. Both exert pressure on the outside muzzle of the horse.

Types of Reins

There are two types of reins—single and split. A single rein is one piece with ends that attach to the bit. Split reins are two separate pieces, each attaching to one side of the bit.

Equine Science

Double and multiple reins are variations on single and split reins. Double reins are used with bits such as the pelham. Multiple reins are used with a team of horses pulling a wagon (one set of reins for each horse in the team).

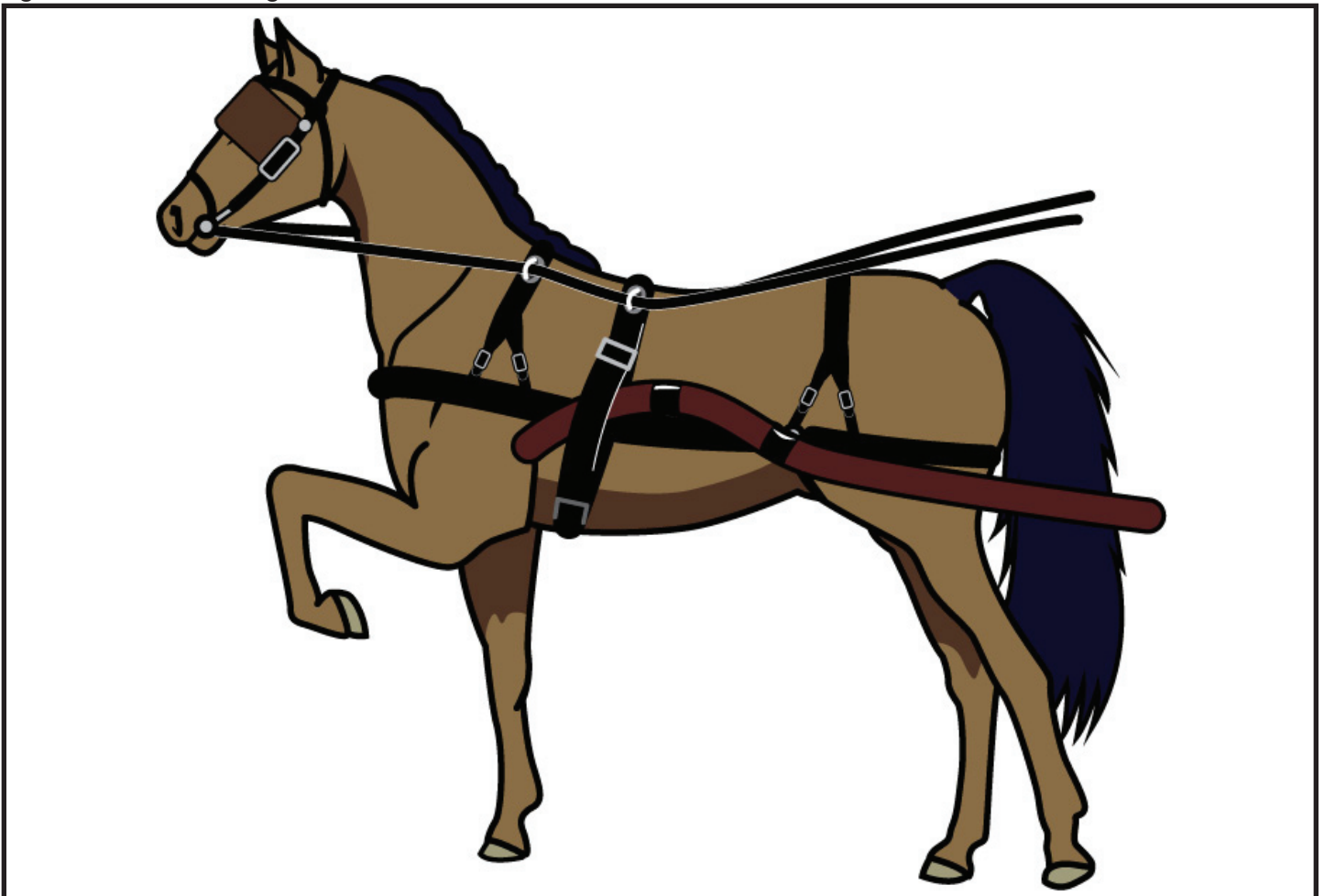
Equipment and Their Uses

Proper equipment for horses includes feeders, waterers, facilities, first aid kits, and grooming supplies. Feeding equipment can be as simple as five-gallon buckets for waterers and feed buckets, or it can be prefabricated especially for horses. There are advantages and disadvantages to each, with the main difference being cost. Feeding can also be done without any containers at all by pouring the feed on the ground. However, the biggest disadvantage is a greater chance of the horse picking up parasites from the ground. Using a watering fountain costs more but will help ensure available, fresh, clean water supply.

Every owner should have a grooming kit and a first aid kit on hand. These, too, can be simple (containing only the basics) or they can be very complete and contain everything available for use with horses. A basic first aid kit should contain scissors, gauze, rolled cotton, antiseptic, crepe bandage, vet thermometer, alcohol, iodine, a clean bucket, tape, antibiotic dressing, and a twitch. (See Restraints in Lesson 9 for more information on twitches.) First aid kits should also contain vet wrap, a clingy support wrap. Vet thermometers are specially designed for rectal use with livestock.

A grooming kit should contain at least a brush, hoof pick, sweat scraper, body brush, mane-and-tail comb, curry comb, clippers, shampoo, wash cloth, and a clean bucket. Each kit will be individualized, depending on owner preferences. Disinfect grooming tools and equipment routinely to prevent the spread of disease.

Figure 8.5 - Horse in Single Harness



Equipment and Facilities

The final part of equipment deals with transportation. Horse trailers are a big investment that must be justified. For an owner who does not go to rodeos or horse shows frequently, consider hiring someone to haul the horse(s) when needed. If a trailer is justified, consider several factors. It must be both road-safe (in good condition) and safe inside. If it is larger than a one-horse trailer, it should have a partition and adequate padding. If needed, a ramp should be long enough so that it is not too steep. Ramps should have traction so the horse will not slip while walking on it.

Costs of Equipment and Facilities

Depending on the owner's preferences and budget, equipment can be minimal or plentiful. When purchasing any equipment, put safety considerations first. Fencing is a major safety concern and should be as strong as possible. Fencing can be made from many different materials (post and rails, woven wire, pipe, boards, or wire) but should never be barbed wire.

Facilities range from simple and inexpensive to very costly. Regardless, facilities should always provide shelter to avoid such health problems as rain scald, a fungus that develops during continuous rain. Some kind of feeding and watering equipment is also needed. Horses kept in stalls need regular exercise.

There are numerous manufacturers of equine equipment, and prices will vary from dealer to dealer. Whether an item is portable or stationary also affects its cost. Get to know how something new works before purchasing it to make sure it will work for the desired operation.

Owning a horse is a big responsibility; even with the simplest of operations, it will not be inexpensive. Equipment needs to be maintained and occasionally replaced.

Summary

Understanding the different types of equipment used to handle horses helps make owning a horse safe and enjoyable. There is a wide assortment of products on the market that are designed just for horses. Horse enthusiasts should learn how a piece of equipment works before deciding to purchase it. Will it fit their needs? The style of equipment selected will depend on the type of riding or work that will be done, what the owner wishes to accomplish, and the size of the horse.

Credits

Curriculum Material for Agriscience 334: Equine Science (Topic #8899-B). College Station, TX: Instructional Materials Service, Texas A&M University, 1990.

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Equine Management and Production. Stillwater, OK: Curriculum and Instructional Materials Center, Oklahoma Department of Vocational and Technical Education, 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

University of Missouri-Columbia Extension Division agricultural publications

- a. G2844: Haltering and Tying Horses
- b. G2845: Choosing, Assembling and Using Bridles
- c. G2887: Selecting a Saddle

Lesson 9: Handling Horses

Safety is the most important aspect of handling horses, for both the rider and the horse.

Leading a Horse

When leading a horse, a handler should always walk to the left of the horse with the right hand about 12-18 inches from the horse's head. The remaining length of rope should be held in the left hand, but not coiled around the hand. To prevent rope burn, never let a rope slip through the hand.

Walk evenly with the horse's head—not in front of it or too far behind it. Always make sure that gates are fully open. When releasing a horse into a stall or field, go all the way inside before unhooking the halter. Never leave a halter on a horse that is left out in the field. Horses wearing halters in the field can get caught on things, causing injury or even death. Halters need to be refitted periodically on young animals. If adjustments are not made, strangulation could result.

Lunging

Lunging is a method of exercising and training a horse. Lunging can be done anywhere, but is best done in a circular pen that is about 30 feet in diameter. It is an excellent method of training a young horse to walk, trot, canter, and stop on command. When lunging, always work the horse equally in both directions. Lunging can also be an excellent way to rehabilitate a horse that has been injured and cannot be ridden. It gives horses the exercise they need without stress.

Mounting and Dismounting

Before mounting, make sure the saddle is in the correct position and that the saddle blanket has not slipped or bunched up. Also, check that the girth is tight. Before mounting a horse, first move it forward a few steps to make sure it is standing squarely. Most people mount from the left side. Insert the left foot in the stirrup, straightening the left leg while swinging the right leg over the horse's back. Dismounting is simply reversing the mounting process.

Equitation

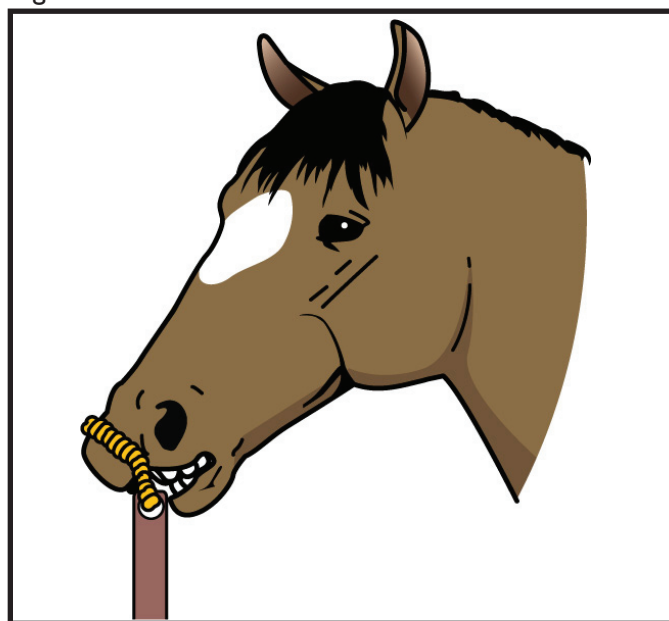
Equitation is the process of riding. There are several styles of riding; Western and English (hunter-jumper, hunt seat, racing, and dressage) are the most common. Most styles of riding are either Western or English. The English-type events contain more jumping and ballet-type movements than Western events.

Restraints

It is important that a handler be able to properly restrain a horse when needed. The method of restraint will depend on the horse and its temperament. The simplest form of restraint is the halter. For most occasions, this will be all that is needed.

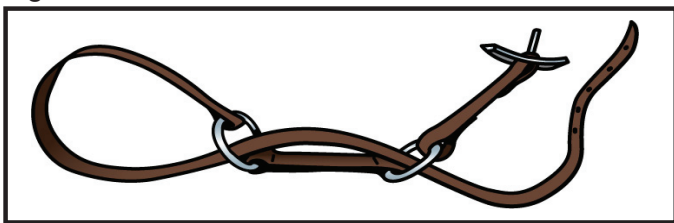
Occasionally, it becomes necessary to use something stronger. In this instance, grip the neck or twist an ear to restrain the animal. If this does not work, a mechanical device known as a twitch can be used. (See Figure 9.1.) A twitch can be either a loop of rope that is attached to the end of a wooden rod or a scissor-type device. Either type works about the same because they are put on the upper lip and pressure is applied. This pressure causes the horse's brain to release endorphins that act to calm the horse. Rubbing the upper gums also calms the horse. Other methods of restraining a horse are sidelines and hobbles. Sidelines keep one of the horse's feet off the

Figure 9.1 - Twitch



Equine Science

Figure 9.2 - Hobbles



ground, while hobbles fit around the ankles and limit the speed an animal can walk. (See Figure 9.2.)

Haltering

To catch and halter a horse, generally approach from its left side. Never approach directly from the front or from the rear because it cannot see well there. Always make the horse aware you are coming, never rush, and be confident. As you reach the horse, slip the lead rope around its neck to help restrain it, and then slip the halter around the neck and fasten it.

If the horse is hard to catch, keep the lead rope out of sight and keep the horse in a smaller area. Reward the horse after catching it, and remember that patience is a must.

Never tie the rope to yourself or allow yourself to become entangled. If the horse is startled, the handler could be dragged behind it. When tying a lead rope, it is important to tie to a secure object. The amount of freedom given to the horse's head is also critical. If too much freedom is given, the horse can get tangled in the rope. If too little slack is given, the horse could feel confined and react violently. (See Figure 9.3.)

Grooming

Grooming is an important part of the horse's health and training. Grooming keeps parasites down, helps maintain coat condition, teaches the horse to stand patiently, and gives the handler an opportunity to check for injuries. The amount of time and the frequency of grooming depends on the conditions in which the horse is kept. A horse that is kept in a stable and is ridden a great deal will need grooming more frequently than one that is kept out in a pasture and ridden infrequently.

When washing a horse, the excess water can be removed with a sweat scraper. Use cool (not ice cold) water in the summer and warm water during cool weather. Then, brush the horse with the grain (the direction the hair lies). If needed, any hair around the bridle path would be clipped. (The bridle path is the area behind the ears where the strap of the bridle goes.) The bridle path should be kept clipped so the hair won't get tangled in the buckle of the bridle strap. If the weather is cool or insects are numerous, it might be necessary to put a blanket on the horse, especially if the horse is kept in a stable.

The mane and tail on some horses are braided for show. This also keeps the mane all on one side and out of the rider's way. If the mane or tail grows too long, it will get matted and will take several hours to undo. Grooming for show is similar to daily grooming except that more attention is given to fine details. Different people have different ways of preparing their horses for show. Grooming will also vary from breed to breed.

One other important thing that should be done while grooming is to pick out the hoofs. This will help prevent stone bruises and thrush.

Safety Precautions for Trailering

The trailer should be in top condition with all running lights, latches, padding, and brakes in proper working order. The horse should have a strong, properly fitted halter, and lead rope. The horse should be well groomed with its legs wrapped for protection. Also, the tail should be wrapped to prevent it from being tangled by the wind. If the weather is cool, a blanket should be used to prevent the horse from getting too cold. The horse should be fed and watered two or three hours before loading. If going on a long trip, plans should be made to stop along the way to give the horse water and let it stretch its legs.

To load the horse, be careful when getting behind it. If it is resistant to loading, it might kick, which can injure a person severely. If needed, a rope can be tied around the hindquarters and pulled by the person leading the horse. If the trailer does not have a walk-through door at the front but only a side window, it is not advisable to lead the horse in. Instead, use a long rope and run it

Handling Horses

through the window to prevent getting crushed if the horse decides to go inside suddenly.

Before driving, double-check latches and prevent horses from putting their heads out of windows. A hay bag can be used to help keep the horse occupied while traveling and to give it some nourishment on a long trip. Tie the bag high enough to prevent leg tangling.

To unload a horse, use caution that the horse doesn't bolt out of the trailer. Always unload in a fenced-in area. Do not get between the horse and the trailer to avoid being pinned against the wall.

Regulations Dealing with Horses

Whether traveling in or out of state, it is a good idea to call the Department of Agriculture to determine what quarantine regulations exist in that state. Some local regulations might also apply. For example, one regulation might require a negative Coggins blood test before being allowed to participate in a local saddle club show. It is also a good idea to have liability insurance. This will protect the horse's owner in case of an accident. An owner can contact an insurance representative to check on appropriate coverage.

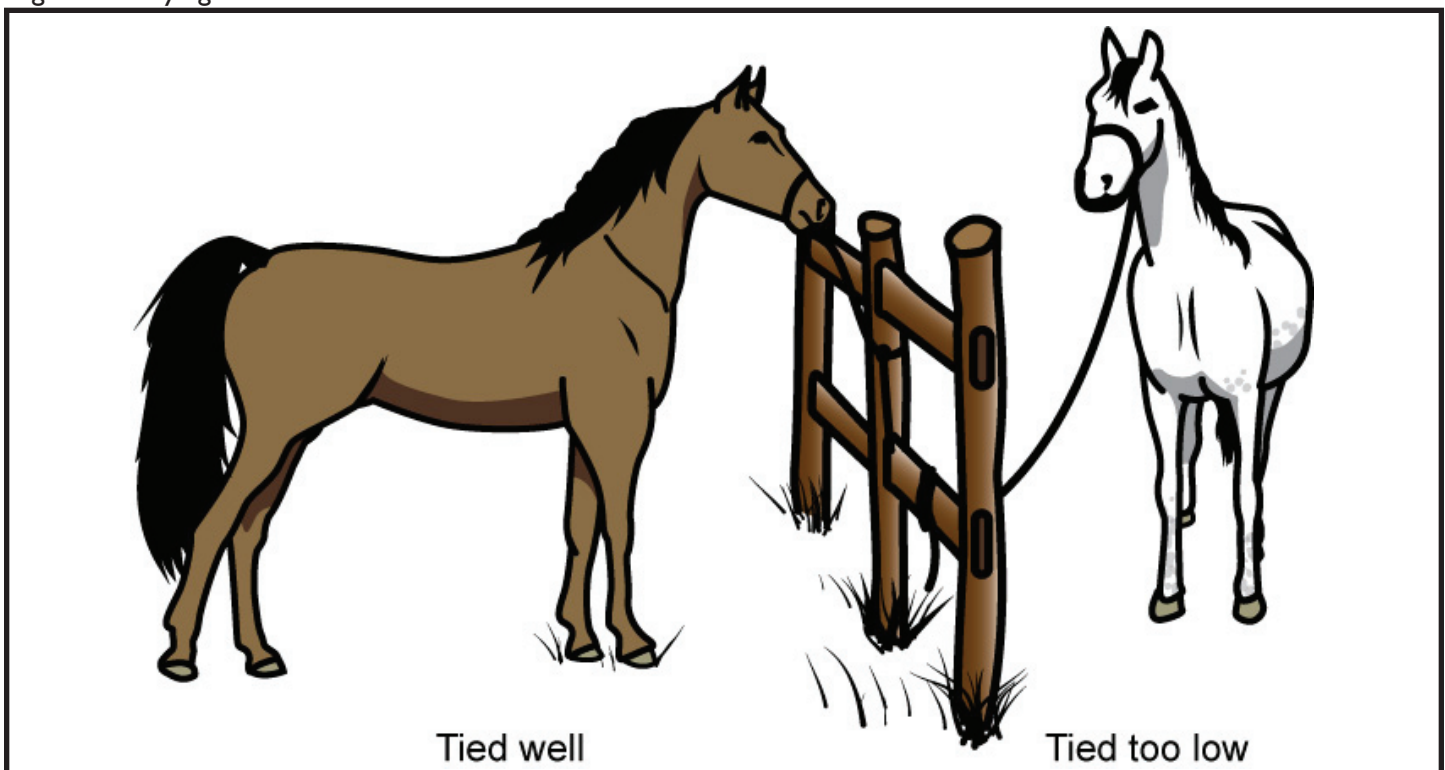
When buying a horse, it is a good idea to have a veterinarian give it a checkup. It is strongly advised to investigate regulations before going to a show or transporting the horse anywhere. Check with a local Extension agent, veterinarian, saddle club representative, and/or the Department of Agriculture for regulations. It can save a lot of time and money in the long run.

Summary

Owning and handling horses can provide a great deal of enjoyment, but it requires thought, planning, and care. Without enough preparation, there will be many problems.

The next important thing to remember in order to have an enjoyable experience with a horse is **safety**. Nothing can substitute for following safe practices when handling a horse. Remember that horses are a great deal larger than people and can injure someone without meaning to. It is also important to remember that horses depend on their owners to provide them with proper care and a safe environment.

Figure 9.3 - Tying a Horse



Equine Science

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

Lesson 10: Career Opportunities

There are many opportunities available in the horse industry for those who have the desire to work with horses. These opportunities are broken into two main types: primary and secondary. Either type offers many rewards and can become long-lasting careers.

Career Opportunities

A primary career is one that deals directly with horses, such as a trainer or handler. A secondary career is one that works with horses but has limited or no contact with them. Some examples include someone who sells equine pharmaceuticals or someone who makes horse trailers. Both careers contribute to the equine industry, although the workers may or may not have direct contact with horses.

Someone who wants to work with horses directly should gain as much experience in the industry as possible. A person does not need to be an owner to get into the horse industry. In fact, many trainers and race track jockeys do not own the horses they work with because these horses are very expensive to buy and own.

Examples of different careers in the horse industry are owner, trainer, stable manager, veterinarian, jockey, farrier, auctioneer, rodeo announcer, concession stand worker, and grounds keeper.

Supporting Income

Most people who own horses do so as a hobby or raise them in a limited way. Usually, these individuals have another job that helps support the horse operation. Many breeders who raise horses incorporate another aspect of the horse industry to maintain the style of living they require. This includes boarding or training horses as a service to others.

Emerging Technologies

With technology changing very quickly, many new ways of breeding and training are being developed. In the past, a horse with a broken leg was destroyed. Frequently today, the animal can be treated successfully and live a

normal life. Another development is the use of artificial insemination. Saving the semen or eggs from superior horses to use later is a step toward improving the future genetic pool of horses.

Training has also benefitted from technology. Blood samples can be taken to determine a horse's maximum amount of exercise. New equipment, such as a swimming pool especially designed for the horse, has advanced training a great deal.

Marketing Horses

There are several marketing options available to a horse breeder. The breeder can sell the best horses as breeding stock, either as mature breeders or as yearlings. The monetary amount that a horse will bring depends on its blood lines and the past performances of its ancestors. Another factor in the selling price of horses is the geographic area's needs and the breed of the horse. In European and Asian countries, horses are also sold for meat.

Summary

The horse industry has many careers available to an individual. A person does not have to work directly with horses to be involved in the horse industry. However, for those who do want to work with horses, there are many opportunities.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Horse Registries and Associations (G2780). University of Missouri-Columbia Extension Division, 1991.