



Texas 4-H HORSE PROJECT Teaching Outlines



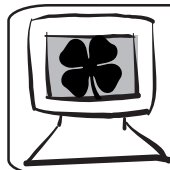
Supporting the Texas Horse Owner's Reference Manual

TEXAS 4-H HORSE PROJECT TEACHING OUTLINES

ACKNOWLEDGMENTS

The content of these teaching outlines was coordinated by Ken Johnson and Jeff W. Howard, Extension 4-H Specialists. Lesson plans were developed by Julianne Mitchell, graduate of the Texas A&M University Horse Science Department, and Vanessa Mason, former Extension Assistant in Animal Science State Horse Office.

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THE DIGESTIVE SYSTEM OF THE HORSE

Subject Matter Outline

Youth should be able to:

- Identify the digestive system of the horse
- List the parts of the foregut and hindgut
- Recognize the functions of each compartment
- Identify factors that affect digestion

I. Introduction

- A. The three types of digestive systems are nonruminants, ruminants and hindgut fermenters.
- B. The digestive tract of the horse includes the foregut and the hindgut.

II. Compartments and functions

- A. The foregut has four components: the mouth, esophagus, stomach and small intestine.
 1. In the mouth, digestion begins, and feeds are chewed and wetted with saliva.
 - a. Chewing reduces particle size and increases surface area of the feed.
 - b. A horse's teeth may need to be floated if it holds its head sideways, drops grain and salivates excessively when it is chewing.
 2. The esophagus is a muscular tube leading from the pharynx to the stomach.
 3. In the stomach, limited enzymatic digestion and some fermentive digestion occur.
 - a. Food remains in the stomach for about 15 minutes.
 - b. The one-way sphincter prevents the horse from belching or vomiting; if excess gas is produced, the stomach can rupture, causing the horse to die.
 4. The small intestine is where most nutrients are absorbed.
 - a. Soluble carbohydrates are digested into simple sugars and used for energy.

- b. This is the primary site for fat digestion and absorption without the gall bladder.
 - c. From 50 to 70 percent of the protein from grain-based diets is digested into amino acids and absorbed.
 - d. Calcium, phosphorus, B vitamins and the fat-soluble vitamins A, D, E and K are absorbed.
 - e. Feed passes through the small intestine in about 30 to 90 minutes.
 - B. The hindgut includes the cecum, large colon, small colon and rectum.
 1. The cecum is a large, sock-shaped pouch between the small and large intestines. It is important in cellulose digestion. During or immediately after eating, mixing activities can be heard.
 2. The large intestine is made up of the large colon, small colon and rectum.
 3. In the hindgut, active populations of bacteria and protozoa break down fibrous feeds into short-chained volatile fatty acids.
 4. Feed passes through the hindgut in 36 to 72 hours.

III. Factors influencing digestion

- A. Type or source of feedstuff
- B. Level of feedstuff maturity
- C. Processing method
- D. Amount fed
- E. Associative affects
- F. Frequency of feeding
- G. Rate of passage
- H. Compounds that interfere with digestibility
- I. Individual differences among horses

THE DIGESTIVE SYSTEM OF THE HORSE

1. *List the types of digestive systems of horses.*

Ruminants
Hindgut fermenters

Nonruminants

2. *List the components of the foregut.*

Mouth
Stomach

Esophagus
Small intestine

3. *What are the signs that a horse needs to have its teeth floated?*

Head sideways
Excess salivation when chewing

Dropping grain

4. *What keeps a horse from being able to belch or vomit, and what are some consequences of this?*

The sphincter at the junction of the esophagus and stomach is one-way; excess gas produced can rupture the stomach and cause the horse to die.

5. *What nutrients are absorbed in the small intestine?*

Carbohydrates
Fat
Protein

Vitamins
Minerals

6. *List the components of the hindgut.*

Cecum
Large colon

Small colon
Rectum

7. *What makes up the large intestine?*

Large colon
Small colon

Rectum

8. *Is it normal to hear gut sounds?*

Yes, it is normal to hear the mixing activities of the cecum.

9. *Where do volatile fatty acids come from, and how do they benefit the horse?*

From broken down fibrous feeds; they are a source of energy

10. *List some factors that can influence digestibility.*

Type or source of feedstuff
Level of feedstuff maturity
Processing method
Amount fed
Associative effects

Frequency of feeding
Rate of passage
Compounds that interfere with digestibility
Individual differences among horses

THE DIGESTIVE SYSTEM OF THE HORSE

1. *List the types of digestive systems of horses.*

2. *List the components of the foregut.*

3. *What are the signs that a horse needs to have its teeth floated?*

4. *What keeps a horse from being able to belch or vomit, and what are some consequences of this?*

5. *What nutrients are absorbed in the small intestine?*

6. *List the components of the hindgut.*

7. *What makes up the large intestine?*

8. *Is it normal to hear gut sounds?*

9. *Where do volatile fatty acids come from, and how do they benefit the horse?*

10. *List some factors that can influence digestibility.*

FEEDING MANAGEMENT

Subject Matter Outline

Youth should be able to:

- Estimate feed rations
- Feed by class and condition
- Estimate body weight and condition score
- Know the importance of feeding hay to horses
- Feed concentrates safely
- Manage eating behaviors of horses

I. Introduction

- A. Horse owners should feed according to class, condition, body weight and condition scores.
- B. Horses should be fed adequate roughages.
- C. Concentrates should be fed safely.
- D. The horse's eating behavior needs to be managed.

II. Management points

A. Feed horses according to their class and condition; horses of different nutritional classes require differing amounts of nutrients in their daily diets.

1. The nutritional classes are mature idle, producing, working and growing.
2. Use practical feeding plans.
 - a. Plan A: Feed the same kind of roughage and two to four different concentrate feeds.
 - b. Plan B: Feed one well-balanced concentrate and either legume or grass hay.

B. Feed according to the horse's body weight.

1. Weigh the horse with a scale or by using body measurements, weight tapes or visual estimation.
2. Heart girth tape is the most common estimation tool.
3. Use this equation to determine body weight (measurements are in inches):

$$W = HG^2 \times BL / 330$$

$$\text{Weight (pounds)} = \frac{(\text{Heartgirth} \times \text{Heartgirth} \times \text{Body length})}{330}$$

C. Feed according to condition scores.

1. First, observe and/or feel the fat cover at six sites: back, ribs at midbarrel, neck, behind shoulders at the forerib, withers and tailhead.
2. Then compare the estimates to the descriptions on a scorecard and determine a score.

D. Feed adequate roughages.

1. Feed a minimum of 0.75 to 1 percent of the horse's body weight to satisfy its needs.

2. Normal stall behavior indicates that the horse is being fed adequately; horses may have been fed inadequately if they chew wood or eat bedding.
 3. Lack of roughages may lead to cribbing, which is hooking the teeth on a solid object, pulling back and swallowing gulps of air.
 4. Prevent cribbing by feeding enough high-quality, long-stemmed roughage daily to decrease boredom and wood chewing.
 5. To maintain hay quality, protect it from moisture.
 6. Feed hay in well-designed mangers to hold the leaves and to keep the horses from ingesting dirt or feces.
- E. Feed concentrates safely.
1. Store the feed to keep it dry and free of insects and rodents.
 2. To keep commercial feeds fresh, do not store them for more than 1 month.
 3. Feed concentrates and hay by weight, not by volume; concentrates differ in weights.
 4. Never feed more than 0.75 percent of the horse's body weight at any one feeding.
- F. Manage the horse's eating behavior.
1. Space multiple feedings throughout the day to give the horse's digestive tract equal time to digest each meal.
 2. Feed the horse at set times daily, because it encourages consistent feed consumption and lowers the probability of many stall vices.
 3. Avoid abrupt ration changes: Increase feed intake or change energy concentrations over 10 days; change textures or hays over 3 to 5 days.
 4. Check daily for feed refusals, which indicate that the horse is being overfed, the feed or hay is bad, water supply is inadequate, or the horse is sick or has teeth problems.
 5. Avoid free-choice mineral supplementation, except for a mature idle horse.
 6. Do not supplement or dilute balanced rations, which can lead to major nutritional problems.
 7. Provide salt for all horses.
 8. Always provide clean, fresh water.
 9. Recognize feeding-related behavioral problems.

1. *List the nutritional classes of horses.*

Mature idle	Producing
Working	Growing

2. *If weighing by scale is impractical, what are some other ways to determine a horse's body weight?*

Visual estimation	Weight tapes
Body measurement formula	

3. *What six sites on the horse are used to determine a condition score?*

Back	Ribs at midbarrel
Neck	Behind the shoulders at forerib
Withers	Tailhead

4. *What is the minimum percentage of body weight that a horse should consume as roughages?*

0.75 to 1 percent daily

5. *What is cribbing, and how can you prevent it nutritionally?*

Cribbing is hooking the teeth on a solid object, pulling back and swallowing gulps of air. Prevent cribbing by feeding enough high-quality, long-stemmed roughage daily to decrease boredom and wood chewing.

6. *What is the maximum amount of time you should store commercial feeds, and why?*

1 month, to maintain freshness

7. *True or False: You should feed by volume.*

False. Feed by weight; concentrates and hays differ in weights.

8. *What could a refusal of feed suggest to a horse owner?*

The horse was overfed.	The horse is sick.
Something is wrong with the feed or hay.	The horse has teeth problems.
The horse had limited access to water.	

9. *True or False: Altering a commercially manufactured feed by supplementation or dilution enhances a diet's nutritional value.*

False: Supplementation or dilution decreases the value of the diet.

10. *List some feeding-related behavior problems and possible solutions. (The answers are not in the text, but should come from general discussion.)*

Agonistic or aggressive behavior: Minimize close contact competition when eating or use partitions in stalls.
Bolting feed: Feed in large shallow troughs, put large objects in feed, or feed extruded feeds.
Pecking order aggressiveness: Provide separate feeders far apart with additional feeders.

1. *List the nutritional classes of horses.*
2. *If weighing by scale is impractical, what are some other ways to determine a horse's body weight?*
3. *What six sites on the horse are used to determine a condition score?*
4. *What is the minimum percentage of body weight that a horse should consume as roughages?*
5. *What is cribbing, and how can you prevent it nutritionally?*
6. *What is the maximum amount of time you should store commercial feeds, and why?*
7. *True or False: You should feed by volume.*
8. *What could a refusal of feed suggest to a horse owner?*
9. *True or False: Altering a commercially manufactured feed by supplementation or dilution enhances a diet's nutritional value.*
10. *List some feeding-related behavior problems and possible solutions. (The answers are not in the text, but should come from general discussion.)*

A SIMPLE FORMULA TO ESTIMATE HORSE BODY WEIGHT

Subject Matter Outline

Youth should be able to:

- Use the body weight formula to estimate a horse's weight
- Know how and where the measurements are taken for the formula

I. Introduction

- A. Knowing a horse's body weight can help you determine how much feed it needs daily.
- B. A simple formula can be used to estimate fairly accurately the body weights of individual horses.

II. Formula

- A. The formula uses heartgirth circumference, body length measurements and an adjustment factor.

1. $(\text{Heartgirth} \times \text{Heartgirth} \times \text{Body length}) = \text{Weight (pounds)}$

330

2. Take measurements in inches with a measuring tape at least 75 inches long.
 - a. Plastic measuring tapes are preferred over cloth.
 - b. Metal measuring tapes are the least desirable, as they often scare the horse.
 3. To measure the heartgirth, run the tape all the way around the horse, using the highest part of the withers.

4. Measure body length from the point of the shoulder, straight back along the horse's side, and to the point of the buttock.

- a. The tape should go around the corner of the hip and to the actual point of the buttock, which is essentially half the distance from the corner to the tail.

- b. Two people are needed to measure body length.

- B. When learning to use this weight estimation system, it is often useful to weigh the horse on a scale for comparison.

- C. It is important that the horse stand somewhat square during measurements.

- D. If you take measurements of a horse to compare its changes in weight over time, always take them at the same time of day. The best time is in the morning before feeding.

III. Summary

- A. The equation appears to be more reliable than visual observation in estimating weight.

- B. The procedure may not be highly accurate for pregnant mares or for horses with extreme conformational irregularities.

A SIMPLE FORMULA TO ESTIMATE HORSE BODY WEIGHT

Q&A

1. *What is the formula for estimating body weight?*

$$\frac{(\text{Heartgirth} \times \text{Heartgirth} \times \text{Body length})}{330} = \text{Weight (pounds)}$$

2. *What is the unit of measurement for the formula?*

Inches

3. *Where is the heartgirth measurement taken?*

All the way around the horse's heartgirth using the highest part of the withers

4. *How is the body length measured?*

Two people measure from the point of the shoulder, straight back along the horse's side to the point of the buttock.

5. *What is the best time of day to take measurements, especially to compare changes over time?*

Same time of day, preferably in the morning before feeding

A SIMPLE FORMULA TO ESTIMATE HORSE BODY WEIGHT

Work Sheet

1. *What is the formula for estimating body weight?*
2. *What is the unit of measurement for the formula?*
3. *Where is the heartgirth measurement taken?*
4. *How is the body length measured?*
5. *What is the best time of day to take measurements, especially to compare changes over time?*

FEEDING THE MATURE IDLE HORSE AT MAINTENANCE

Subject Matter Outline

Youth should know:

- The nutrient requirements of the various horse classes
- How nutrients are expressed

I. Introduction

- A. There are three basic concepts in designing a feeding program.
 1. Know the nutrient requirements of the various horse classes.
 2. Know the nutrient composition of the feedstuffs available for feeding.
 3. Combine the feedstuffs into a ration that meets the horse's requirements in the safest, simplest and most economical fashion.
- B. A publication, "Utilizing the Nutrient Requirements of Horses," gives information on horse nutrition requirements.
 1. Section 5, Nutrient Requirement Tables, provides seven tables on the daily nutrient requirements of many horses, from 440-pound ponies to 1,980-pound horses.
 2. Dry matter is 100 percent dry feedstuffs.
 3. As fed, feedstuffs contain about 10 percent moisture and 90 percent dry matter.

II. Feeding the mature horse at maintenance

- A. Energy can be expressed in megacalories (Mcal) of digestible energy.
 1. Calorie is a term used to measure combustible energy in feeds; it relates to the amount of physiological fuel in the feed (1 Mcal = 1 million calories).
 2. Digestible energy (DE) is the usable amount of energy from the feed after digestion.
 3. Total digestible nutrients (TDN) refers to the content of feedstuffs; 1 pound of TDN is about 2 Mcal of DE.
- B. Protein requirements are expressed as actual pounds of crude protein required daily, or the percentage of crude protein in the total diet.

C. Calcium and phosphorus are generally considered together, because bones require them together for formation and maintenance.

1. The average ratio of calcium to phosphorus is 1.5:1 to 2:1.
2. Rations should never contain more phosphorus than calcium.

D. Traditional horse diets contain enough of most vitamins, except for vitamin A.

1. Horses normally consume enough carotene (vitamin A's precursor) from eating green growing forages or fresh hay.
2. Carotene is unstable in sunlight and at high temperatures, which means that weathered and older hay (more than 6 months) contains little or no vitamin A.
3. Corn is the only cereal grain containing carotene. Horses receiving feeds rich in carotene can produce and store a 3-month supply of vitamin A in the liver. However, this supply can be depleted when carotene intake is low.
4. Add synthetic vitamin A to complete horse feeds, supplements, additives, etc., to provide the levels the horse needs.

III. Conclusion

- A. Mature idle horses can be maintained on good-quality pasture or hay with free-choice access to trace minerals (TM), salt and water.
- B. When pastures or hays are of questionable quality, feed the mature idle horse 0.5 to 1 percent of its body weight of a concentrate feed to provide the nutrients not provided by the forage.
- C. Maintain mature idle horses at a body condition score of 4 to 5.

1. *Where can you find the nutrient requirements for a 1,100-pound horse?*

NRC, Section 5

2. *What is the average daily feed intake for a horse?*

2 percent of its body weight

3. *What are the major quantitative nutrients?*

Energy

Calcium

Vitamin A

Protein

Phosphorus

4. *Define calorie.*

Calorie is a term used to measure combustible energy in feeds; it relates to the amount of “physiological fuel” in the feed.

5. *What is TDN, and how does it compare to DE?*

Total Digestible Nutrients; 1 pound of TDN is about 2 Mcal of DE

6. *What is crude protein?*

The estimated total amount of protein required assuming average digestibility of all feeds

7. *What is the ratio of calcium to phosphorus for horses?*

1.5:1 to 2:1

8. *True or False: Hay that has been stored outside for 10 months has enough vitamin A for horses.*

False. Hay more than 6 months old has little or no vitamin A.

9. *At what body condition score should mature idle horses be kept?*

4 to 5

FEEDING THE MATURE IDLE HORSE AT MAINTENANCE

Work Sheet

1. *Where can you find the nutrient requirements for a 1,100-pound horse?*
2. *What is the average daily feed intake for a horse?*
3. *What are the major quantitative nutrients?*
4. *Define calorie.*
5. *What is TDN, and how does it compare to DE?*
6. *What is crude protein?*
7. *What is the ratio of calcium to phosphorus for horses?*
8. *True or False: Hay that has been stored outside for 10 months has enough vitamin A for horses.*
9. *At what body condition score should mature idle horses be kept?*

READING THE FEED TAG

Subject Matter Outline

Youth should be able to:

- Understand the basics of equine nutrition
- Obtain specific information about the feed from feed tag

I. Introduction

- A. The best way to feed horses is to put them on the best available forage along with a balanced commercial grain concentrate. This is the most efficient and most cost-effective way to feed small herds.

II. Reading the feed tag

- A. The horse owner should have a basic knowledge of equine nutrition and specific information about the feed being fed.
- B. Most of the information needed is printed on the feed tag.
- C. Feed tags must list the ingredients; the minimum percentage of crude protein, crude fat and crude fiber; and the maximum and minimum amount of minerals and drugs.
- D. To find out the ratio of calcium to phosphorus in a feed, ask the dealer or the nutritionist at the manufacturer.
- E. Crude fat is the percentage of ether extractable fat in a feed.
1. The range of crude fat is 3 to 3.75 percent.
 2. The range of crude fat at 8 to 13 percent has added/ supplemental fat of 5 to 10 percent.

- F. Crude fiber is an estimate of the poorly digestible part of the ration including the indigestible portion. As long as the feed is no more than 9 to 10 percent crude fiber, it is a high-energy feed.

- G. Horse owners must constantly be aware of potential feed problems.

1. Be sure to account for weight differences between feeds, such as when switching between loose grain or concentrates or pellets.
2. Be careful not to give horses feed that is formulated for ruminants (such as cattle feed) and medicated with Rumensin or Bovatec.

- H. Horses should be managed as individual animals.

III Conclusion

- A. The purpose of shopping for feed is to get the most nutrition for the least money.
- B. To formulate a balanced ration for a horse, the owner should have a sound estimate of the energy and protein content of the hay or grass it eats.
- C. Every feed company has a horse ration that is "least costed," an industry term meaning that the product was designed to fill certain nutrition requirements for the lowest possible price.

1. *True or False: On the feed tag if crude fiber is not more than 12 percent, then an energy amount can be estimated.*

True

2. *What is listed on the feed tag?*

Minimum percent crude protein
Minimum percent crude fat
Maximum percent crude fiber
Maximum and minimum amount of minerals and drugs
Ingredients

3. *If the tag reads "9 percent crude fat," how much is crude and how much is supplemental?*

About 3 percent crude, 6 percent supplemental

4. *If supplemental fat is added, how does it affect the energy density?*

It makes it more dense.

5. *How would you find out the ratio of calcium to phosphorus in a feed?*

Ask the dealer or the nutritionist at the manufacturer.

6. *What should you be wary of if you buy cattle feed?*

If the feed is medicated with Rumensin or Bovatec, do not feed it to horses.

1. *True or False: On the feed tag if crude fiber is not more than 12 percent, then an energy amount can be estimated.*
2. *What is listed on the feed tag?*
3. *If the tag reads "9 percent crude fat," how much is crude and how much is supplemental?*
4. *If supplemental fat is added, how does it affect the energy density?*
5. *How would you find out the ratio of calcium to phosphorus in a feed?*
6. *What should you be wary of if you buy cattle feed?*

USING FORAGES

Subject Matter Outline

Youth should be able to:

- Discuss factors that influence digestibility of forages for horses
- Identify the factors affecting forage quality

I. Introduction

- A. Horses need daily access to hay or pasture, because these forages contribute energy, protein, minerals and vitamins at varying levels, depending on forage species and quality.
- B. If improved pastures are managed to maximize forage quality and production, they can meet the nutritional needs of mature, nonproductive horses with little or no supplementation from grain or hay for many months of the year.

II. Nutrient digestibility

- A. Although forages contain many of the same nutrients as grain, the balance and availability of the nutrients differ.
 1. Because of its digestive tract, the horse is better adapted to use forage than is a simple stomach animal such as a pig, but is limited compared to ruminants such as cattle.
- B. Forages supply energy.
 1. One form of energy is fiber.
 2. The horse does not break down fibrous energy compounds, such as cellulose, as well as it breaks down other energy compounds, such as starch.
 3. As the fiber content of a forage increases, the availability of energy decreases.
- C. One way to make the fiber more digestible is to process the forage.
- D. Forages also can effectively supply protein to horses. Research has shown that horses can digest about 50 to 80 percent of forage protein.
- E. Forages also contribute vitamins and minerals, such as vitamins A, D and B, and large amounts of calcium.

III. Forage quality

- A. Forage quality can be determined by chemical analysis for nutrient content, and by visual observations for foreign material, leafiness and color.
- B. The nutrient content of pasture forage is influenced by management techniques such as fertilization and plant characteristics such as stage of growth.
- C. Quality indicators that can be seen include color, leafiness, type of hay, stage of maturity and amount of foreign material.
 1. The stage of maturity greatly affects quality of both grass and legume hays: As a plant matures, the available nutrients decrease.
 2. Leafiness is a good indicator of quality because, compared to stems, leaves contain about twice the amount of nutrients.
 3. The presence of much foreign material makes horses extremely susceptible to colic and other digestive disorders.

IV. Relating forage use to ration formulation

- A. All classes of horses should have daily access to pasture or high-quality hay of at least 0.75 to 1 percent of their body weight.
- B. Testing the hay can help you estimate the nutrient content of forage accurately.
 1. The energy content of the hay can be expressed as total digestible nutrients (TDN).
 2. One pound of TDN is assumed to equal 2 megacalories of digestible energy.
- C. Forages can supply high levels of certain minerals such as calcium, but different forages vary greatly in mineral content and availability.
 1. Most grain mixes should contain at least a 1:1 ratio of calcium to phosphorus, so that the overall balance is never less than 1:1 in the total ration.
 2. This balance is especially important when designing rations for growing horses, because mineral imbalances can cause severe skeletal abnormalities.

1. *As a fiber content of a forage (a.) _____, the availability of energy (b.) _____.*

Increases, decreases

2. *What is one way to improve fiber digestibility of a forage?*

Process the forage before feeding

3. *What percentage of forage protein can horses digest?*

50 to 80 percent

4. *What three factors are considered when visually observing hay for quality?*

Stage of maturity Leafiness
Presence of foreign materials

5. *What effect does plant maturity have on available nutrients?*

As plants mature, the available nutrients decrease.

6. *To meet a horse's minimum nutritional requirements, what percentage of its body weight should be fed in forage?*

0.75 to 1 percent

7. *What factors affect the nutrient content of pasture forage?*

Management techniques such as fertilization, and plant characteristics such as stage of growth

8. *Why is leafiness a good indicator of forage nutrient content?*

Compared to stems, leaves contain twice the amount of nutrients.

1. As a fiber content of a forage (a.) _____, the availability of energy (b.) _____.
2. What is one way to improve fiber digestibility of a forage?
3. What percentage of forage protein can horses digest?
4. What three factors are considered when visually observing hay for quality?
5. What effect does plant maturity have on available nutrients?
6. To meet a horse's minimum nutritional requirements, what percentage of its body weight should be fed in forage?
7. What factors affect the nutrient content of pasture forage?
8. Why is leafiness a good indicator of forage nutrient content?

HORSE PASTURES FOR TEXAS

Subject Matter Outline

Youth should be able to:

- Distinguish between warm and cool season pastures
- Know appropriate fertilizing techniques

I. Introduction

- A. The horse is a nonruminant herbivore and grazes high-quality forage to supply its daily nutritional needs.
- B. By using the proper combination of different forages, horses can be successfully pastured most of the year.

II. Classes of grasses adapted for use on pastures

- A. Perennial warm-season pastures: Dallisgrass, bermudagrass and Bahiagrass provide forage from late spring through the fall.
- B. Perennial cool-season pastures: Wheat grass and fescue grass provide high-quality pasture from late fall until spring.
 1. Fescue grass has a fungal endophyte and may be linked to problems with gestating mares.
 2. It is possible to plant fungal-free fescue to help minimize problems.
- C. Annual warm-season pastures: Sudans and sorghums can produce much high-quality forage over a short time.
- D. Annual cool-season pastures: Wheat, oats, barley and ryes produce the highest quality forage available for horses during the fall, winter and early spring.
- E. Legumes such as white clover, vetch and sweet clover can help improve the available pasture or extend its green grazing period.

III. Land preparation and planting

- A. A weed-free, firm, moist seedbed is important in establishing pastures regardless of whether it's from seed or from sprigs.

- B. Perennial grasses grow more slowly and require more time than annuals to become fully established.

IV. Fertilization

- A. Fertilizer is required on improved pastures to obtain high yields of good quality forage.
- B. Fertilize according to results from a recent soil test indicating the soil's nutrient status.

V. Hay production

- A. Hay can be made from almost any type of forage, whether grass or legume.
- B. The basic principle is to cut the plant at a growth stage when it is high in protein and digestibility.
- C. All grasses and legumes are high in quality until the plants start forming seedheads.

VI. Weed control

- A. Weeds deprive new plantings of nutrients and moisture, retard growth and completely crowd out new stands.
- B. Chemical weed control is usually more effective and gives longer control than shredding or mowing.

VII. Management considerations

- A. Horses are spot grazers: Because they eat and eliminate in different areas, spread manure routinely during grazing periods.
- B. Alternate or mix cattle and horses on a pasture.
 1. The cattle will eat some of the mature grass.
 2. Alternating reduces the internal parasite infestation in a pasture because cattle parasites do not harm horses and vice versa.

1. *List three species of warm-season perennial grass.*

Dallisgrass
Bermudagrass

Bahiagrass

2. *List the five classes of grasses adapted for use on pastures.*

Warm season perennials
Warm season annuals
Legumes

Cool season perennials
Cool season annuals

3. *True or False: Annual grasses are quicker to grow and develop fully than are perennials.*

True

4. *What type of weed control is the most effective?*

Chemical weed control

5. *What type of grazer is the horse?*

Spot grazer

1. *List three species of warm-season perennial grass.*
2. *List the five classes of grasses adapted for use on pastures.*
3. *True or False: Annual grasses are quicker to grow and develop fully than are perennials.*
4. *What type of weed control is the most effective?*
5. *What type of grazer is the horse?*

FESCUE

Subject Matter Outline

Youth should be able to:

- Describe management practices for using fescue in a horse pasture.
- Recognize potential symptoms associated with fescue toxicity.

I. Introduction

- A. Tall fescue is the most widely grown forage grass in the United States.
- B. On-farm experience, as well as research studies in several states, reveal that it can either causing devastating foal losses or provide safe, inexpensive nutrition for horses.
- C. Fescue, a cool-season perennial, is the dominant species of an estimated 35 million acres of American soil.

II. Problems with fescue

- A. Fescue has had the reputation of being a poor choice for providing grazing or hay for horses.
- B. Reproductive difficulties of mares grazing fescue have been widely recognized and documented.
 1. Abortions occur late in gestation near the normal foaling date.
 2. Gestation is prolonged; mares may carry a foal for 370 days or more.
 3. Dystocia (difficult birth) may result; very large foals born after prolonged gestation often cause foaling problems.
 4. Thick placenta, which is abnormally thick and/or tough placenta, may occur.
 5. Foals that are large because of the long gestation often die before or during parturition.
 6. Retained placenta, with associated problems (uterine infection, laminitis, septicemia), can cause the mare to be difficult to rebreed.
 7. Agalactia (repressed or reduced milk production) may result; colostrum production may also be affected.
 8. Mare mortality rates increase; dystocia caused by large foals, and complications associated with retained placenta sometimes result in death of mares.
 9. Anticipating birth becomes difficult: Mares often do not exhibit the normal visual signs of impending

birth, with little or no udder development, swelling of the vulva or other signs.

III. Breakthrough discovery

- A. In the 1970s, on-farm investigations indicated that a fungal endophyte might be associated with fescue toxicity.
- B. In the 1980s, experiments showed that the fungus could also decrease reproductive efficiency and milk production in cattle.

IV. Fungus characteristics

- A. The fungus in question is an "endophyte," meaning that it grows inside plants rather than on them.
 1. Endophytes can be detected only by laboratory methods.
 2. The fungus does not harm plant growth.
 3. Most fescue in the United States is infected with fungus at levels of 70 percent or more of the plants in the pasture.
 4. The fungus is transmitted only through the seed; it is not harbored in soil or passed from plant to plant.

V. Dealing with the problem

- A. Eliminate fungus-infected plants.
 1. Have fescue plants tested to determine the level of fungal infection, if any.
 2. Kill the existing fescue using herbicides or tillage.
 3. Avoid planting fungus-free fescue immediately after killing old fungus-infected plants. Allow for other plant growth before replanting fescue.
- B. Remove mares from pastures.
 1. Before foaling dates, remove mares from pastures containing as little as 5 to 10 percent of fungus-infected fescue.
 2. Do not allow mares access to infected fescue at least 90 days before foaling; removing mares 30 to 45 days before foaling greatly decreases the likelihood of reproductive and lactation problems.
- C. Dilution is ineffective; supplemental feeding does not reduce the adverse effects of fungus-ingested fescue on reproduction and lactation.

VI. First-time use of fescue

- A. Producers without fescue acreage can consider planting fungus-free fescue pastures.
- B. Newly established fungus-free plants are less vigorous and have a low stress tolerance.
- C. Avoid overgrazing; fungus-free fescue fields should never be grazed or clipped closer than 4 inches.
- D. Rotational grazing should be implemented to avoid spot grazing.

VII. Fungus-free fescue hay for horses

- A. Fungus-free fescue hay is excellent for horses.
- B. Hay guaranteed to be free of fungus is worth a premium price.
- C. Fescue hay should be well fertilized and cut at the right time.
 - 1. The first cut in spring should be made at boot to early-head stage, and thereafter every 6 weeks.
 - 2. Fungus-free fescue hay cut at early maturity is of excellent quality.

1. *What class of plant is fescue?*

Cool-season perennial

2. *List some specific reproductive problems encountered by mares grazing on fungus-invested fescue.*

Abortion	Prolonged gestation
Dystocia	Thick Placenta
Foal deaths	Retained placenta
Agalactia	Mare mortality
Difficulty in anticipating birth	

3. *What type of fungus causes fescue toxicity?*

Endophyte

4. *Where on the fescue plant does the endophyte fungus grow?*

Inside the plant

5. *How is the endophyte fungus passed from plant to plant?*

The fungus is transmitted only through the seed.

6. *For how many days should mares be removed from fescue pastures before foaling?*

90 days

7. *How is endophyte fungus detected in fescue plants?*

By laboratory methods only

8. *How does the endophyte fungus affect fescue plant growth?*

It does not.

9. *What is agalactia?*

Repressed or reduced milk production

1. *What class of plant is fescue?*

2. *List some specific reproductive problems encountered by mares grazing on fungus-invested fescue.*

3. *What type of fungus causes fescue toxicity?*

4. *Where on the fescue plant does the endophyte fungus grow?*

5. *How is the endophyte fungus passed from plant to plant?*

6. *For how many days should mares be removed from fescue pastures before foaling?*

7. *How is endophyte fungus detected in fescue plants?*

8. *How does the endophyte fungus affect fescue plant growth?*

9. *What is agalactia?*

FEEDING AND STORING HAY

Subject Matter Outline

Youth should be able to:

- Identify and discuss the major sources of hay loss in the process of production, storage and feeding

I. Introduction

- A. Hay is the most common source of stored feed given to horses.
- B. A hay analysis gives producers an idea of how much supplement will be needed to meet animal requirements for each quality grade of hay.
- C. A producer can get more return from hay production by feeding hay according to quality and animal needs.

II. Hay-making losses

- A. The goal of hay making is to harvest excess forage in a high-quality stage, process it in a format that can be stored to maintain quality, and feed it to meet an animal's needs.
- B. Losses can be caused by cutting hay past the optimum stage of maturity, rain leaching out soluble nutrients before baling, respiration of plant tissue or leaf shattering.

III. Storage losses

- A. The percentage of hay moisture at storage is directly related to the nutrient and dry matter losses: The greater the percentage of moisture at storage, the greater the losses.
- B. The main factor in controlling nutrient loss or retention in storage is the moisture content.

1. The greatest nutrient loss occurs on the outer portion of the bale.
2. A firm round bale stored outside for 1 year will lose 22 percent of its dry matter, and after 2 years will lose 32.5 percent of its dry matter.
- C. The greatest loss of material in a round bale occurs at the bottom of the bale where it is in contact with soil.

IV Feeding losses

- A. The amount of hay lost depends on the feeding system and the amount fed per animal each time.
- B. The major feeding losses are from trampling, leaf shatter, chemical and physical deterioration, fecal contamination, over consumption and refusal.
- C. The largest hay losses occur when large hay stacks are fed without animal restrictions.
- D. During the feeding season, hay can be fed in one or in different areas.
 1. Feeding in one area causes excessive sod destruction and usually involves muddy conditions.
 2. A producer should feed on concrete or gravel to reduce hay losses and eliminate some of the muddy conditions.
 3. Feeding in different spots in the field each time can actually improve soil fertility, but it requires more time and is less convenient.

1. *What is the main factor controlling nutrient loss or retention in hay storage?*

The moisture content

2. *List the major causes of feeding loss in hay.*

Trampling	Leaf shatter
Chemical and physical deterioration	Fecal contamination
Overconsumption	Refusal

3. *What area of a stored bale of hay loses the most nutrients?*

The outer layer

4. *What percentage of dry matter does a firm round bale of hay lose when stored outside for 1 year?*

22 percent

5. *List some disadvantages of feeding hay in only one area.*

Excessive sod destruction	Muddy conditions
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1. *What is the main factor controlling nutrient loss or retention in hay storage?*
2. *List the major causes of feeding loss in hay.*
3. *What area of a stored bale of hay loses the most nutrients?*
4. *What percentage of dry matter does a firm round bale of hay lose when stored outside for 1 year?*
5. *List some disadvantages of feeding hay in only one area.*

SELECTION AND USE OF FEEDSTUFFS

Subject Matter Outline

Youth should be able to:

- Identify supplemental concentrates and their benefits
- Discuss processing of grains to enhance their performance

I. Introduction

- A. Varied feed ingredients or combinations can be used successfully if the diet promotes normal digestive tract function, meets nutrient requirements and represents a reasonable amount of feed the horse can consume safely.
- B. All diets should contain enough roughage, with additional nutrients provided in a concentrate feed that is balanced and offered in a way that contributes to the horse's needs and continued well-being.

II. Energy sources

- A. Energy requirements are normally met by feeding one or more cereal grains, which are high in energy density, in a balanced ration.
- B. The concentrate should provide the nutrients not supplied by roughage.
 1. Oats are moderate in energy and protein, and high in fiber; they are reasonably safe for horses, especially those needing limited management.
 2. Corn is high in energy density and in weight volume. Be sure to guard against moldy corn poisoning.
 3. Barley is intermediate in fiber, has a harder kernel than oats and should be processed.
 4. Wheat is an excellent energy source, but guard against using more than 20 percent, and feed it with a bulkier grain.
 5. Sorghum grain is high in energy and varies considerably in protein content.
- C. Colic and/or laminitis can result from diets dense in calories and low in fiber.
- D. Grains sometimes need to be processed to increase digestibility.
 1. Oats: Crimping or flaking increases digestibility by only 5 percent.
 2. Corn and barley: They should be cracked, rolled or steam-flaked to increase digestibility by 7 to 9 percent.
 3. Sorghum, rye and wheat: Processing is highly recommended, because it increases digestibility by 15 percent.

4. Avoid fine grinding.
 5. Pelleting prevents horses from sorting the feed.
- E. Energy feeds can be made more energy dense by adding up to 10 percent more fat or oil.
1. Such feeds contain twice as much energy
 2. Fat-added diets increase the fat percentage of mares' milk in early lactation and causes the fat content to stay higher as lactation advances.
 3. Performance horses can spare muscle glycogen for short-duration, exhaustive exercise by using energy from fats while working aerobically, which leads to increased stamina and delayed onset of fatigue.
 4. Careless topdressing of oil or fat can contribute to digestive disorders and can lower the horse's feed intake.
- F. Oilseed meals provide sources of supplemental protein.
1. Lactating mares and growing horses require additional dietary protein.
 2. Soybean meal has an excellent balance of essential amino acids and is considered a high-quality concentrate.
 3. Linseed meal is deficient in one or more essential amino acids and is considered a low-quality protein concentrate.
 4. When feeding grain-based rations, use only completely balanced pelleted supplements.
 5. Other protein concentrates are plant by-products such as corn gluten feed or corn gluten meal and brewer's grains.
 6. Protein concentrates from animal sources are derived from meat packing houses and surplus milk or milk products.
- G. Provide minerals and vitamins.
1. Because horses cannot regulate their own mineral intake, add the proper amount to the grain mix.
 2. Free-choice mineral supplements can be provided to adult horses, but not to young or stalled horses.
 3. Horses require the fat-soluble and water-soluble vitamins that are normally supplied by green growing forage, sun-cured hays and commercially prepared feeds.
 4. Feed vitamins according to directions, so as not to have potential toxicities or to upset the dietary nutrient balance.

SELECTION AND USE OF FEEDSTUFFS

- H. Commercially manufactured feeds help balance a horse's nutrition.
1. No individual grain alone is nutritionally balanced for all classes of horses.
 2. Most feed companies manufacture a complete line of well-balanced, ready-to-feed horse feeds.
 3. The law requires feed companies to list the amount of crude protein, crude fat, crude fiber and ingredients on the guaranteed analysis tag.
 4. Feeds labeled as "horse feeds" are generally more expensive than feeds labeled for cattle and other animals.
 5. Although cattle feeds can often be fed to horses, make sure the feeds contain no urea, Rumensin, Bovatec,

drugs or other additive medications that could cause the horse to become seriously ill or die.

III. Summary

- A. The foundation of a good feeding program is roughage.
- B. An average guideline for daily roughage intake is 1.0 percent of body weight.
- C. Nutrient needs not provided by the roughage can then be satisfied by using one or more cereal grains in a concentrate.
- D. The time and care given to selecting and using high-quality feedstuffs is worthwhile in feeding and managing horses, because there will be minimal interruptions from digestive disturbances.

1. *Name five acceptable feed concentrates.*

Oats
Barley
Sorghum grain

Corn
Wheat

2. *What does pelleting of feed prevent horses from doing?*

Sorting feed

3. *True or False: Overfeeding oil or fat can decrease feed intake by horses.*

True

4. *True or False: Lactating mares and growing horses require no additional dietary protein.*

False

5. *Why should young or stalled horses not be provided with free-choice mineral supplements?*

Horses cannot regulate their own mineral intake.

6. *What is the most common benefit of grain processing?*

It increases digestibility.

SELECTION AND USE OF FEEDSTUFFS

1. *Name five acceptable feed concentrates.*
2. *What does pelleting of feed prevent horses from doing?*
3. *True or False: Overfeeding oil or fat can decrease feed intake by horses.*
4. *True or False: Lactating mares and growing horses require no additional dietary protein.*
5. *Why should young or stalled horses not be provided with free-choice mineral supplements?*
6. *What is the most common benefit of grain processing?*

ADDING GRAIN AND SUPPLEMENTS TO COMMERCIAL GRAIN MIXES

Subject Matter Outline

Youth should be able to:

- Calculate the effect of adding grains or supplements to a ration
- Consider both cost and nutrition when selecting supplemental grains or hays

I. Introduction

- A. On-farm adjustments can affect a ration's nutrient profile and cost.
- B. Analyzing these effects will enable you to make adjustments to increase rather than decrease the value of a ration.

II. Balancing

- A. Feed requirements for growing horses are based on their body size and growth rate.
- B. To promote healthy growth, balance energy, protein, calcium and phosphorus.
- C. The crude protein content of combined hay and grain should be about 11.5 percent.
- D. The recommended protein-to-calorie ratio for rations fed to yearlings is 45 g/Mcal.
- E. The minimum calcium needs for expected growth rates are 37 grams per day.
- F. Horses need at least 21grams of phosphorus per day.
- G. To calculate the effect of adding grains or supplements, first determine the nutrient profile of the grain and hay mix.

H. Supplements are added to better meet a horse's protein, mineral or vitamin needs.

I. Horses that consume poor-quality protein sources in grain mixes may respond more favorably to supplementation than those consuming high-quality protein grain mixes.

J. If you replace half of the base grain mix with oats, the energy density of many rations is reduced by as much as 10 percent.

K. When corn is used to increase energy concentration, the protein decreases and causes an inadequate balance for sound skeletal growth.

III. General recommendations

- A. Consider both nutritional profiles and cost factors when selecting grains and hays to meet a horse's nutrient requirements.
- B. Add a protein supplement for an accelerated nutritional program only.
- C. Do not add oats to reduce the energy content of the grain mix because they change the mineral profile.
- D. Do not replace part of the grain mix with corn in rations for growing horses because it causes imbalances of protein and energy.
- E. The most common recommendation is to select a prepared grain mix based on the nutrient content of the hay and adjust the ration intake level to meet the desired growth rate.

1. *What are the two factors for balancing a growing horse's ration?*

Body size and growth rate

2. *What are the four necessities to promote healthy growth?*

Energy
Calcium

Protein
Phosphorus

3. *What are the minimum calcium and phosphorus requirements?*

Calcium: 37 grams per day
Phosphorus: 21 grams per day

4. *True or False: Replacing oats in a ration increases the energy density.*

False

5. *True or False: If corn is replaced in a ration, energy and protein concentrations increase.*

False

ADDING GRAIN AND SUPPLEMENTS TO COMMERCIAL GRAIN MIXES

Work Sheet

1. *What are the two factors for balancing a growing horse's ration?*
2. *What are the four necessities to promote healthy growth?*
3. *What are the minimum calcium and phosphorus requirements?*
4. *True or False: Replacing oats in a ration increases the energy density.*
5. *True or False: If corn is replaced in a ration, energy and protein concentrations increase.*

RATION FORMULATION

Subject Matter Outline

Youth should be able to:

- Formulate a ration using basic feedstuffs
- Identify the proper amounts of nutrients needed in a ration based on the horse's age and level and production

I. Introduction

- A. To achieve production and management goals, the proper amounts and types of nutrients must be supplied so that horses can use them safely and efficiently.
- B. The nutrient needs of horses vary for the different stages of growth and production.

II. Nutrient requirements

- A. Horses require feed to supply energy, protein, minerals and vitamins for maintenance and production.
- B. The amounts of nutrients needed depend on the size and production status of the horse.
- C. Growing horses need higher nutrient concentrations in rations than do mature horses because of the combination of increased need and daily intake limits.
- D. Energy sources must be digestible; needs are provided for efficiently in the form of carbohydrates and fats.
 1. Energy requirements are measured in megacalories (abbreviated Mcal).
 2. If a horse takes in more energy than it needs to fuel its body for maintenance, production and growth processes, the excess energy will be deposited as fat.
 3. Heavier mature horses require more energy to maintain their body than do smaller horses.
 4. Working horses need more energy than horses not being forced to exercise.
 5. Gestating mares, lactating mares and growing horses need much energy for maintenance and to fuel their production state.
 6. Rations for growing horses, working horses and broodmares in production need to have more energy per pound of ration than do horses at maintenance.
- E. Horses need a certain amount of protein for daily body maintenance.
 1. Producing and growing horses need a more dense (higher percentage) protein to meet the increased needs.
 2. Proteins are made up of amino acids needed for muscle growth, enzyme and hormone synthesis, and other vital body processes.

3. Nutritionists commonly use the amino acid lysine to balance rations for growth and production.
 - a. Lysine concentrations should be 0.5 to 0.6 percent in rations for growing horses.
 - b. For horses in production, the lysine concentration should be from 0.3 to 0.4 percent.
- F. Minerals are important to develop and maintain a strong skeletal system.
 1. Rations formulated for growing and producing horses typically have a higher mineral concentration than rations for maintenance horses.
 2. Rations are commonly balanced for calcium and phosphorus.
 - a. Diets of horses should contain 1.5 to 2.5 times more calcium than phosphorus.
 - b. This ratio is important for the two minerals to be used and absorbed properly; phosphorus levels should never exceed calcium in the total ration.
 3. It is standard practice to allow all horses free access to a trace mineralized salt block.
 4. It is standard practice to fortify grain mixes for growing, working and producing horses with mineral premixes to help the body to develop or to replace losses.
- G. Most vitamin requirements of horses are supplied by grains and forages.
 1. Vitamins are necessary for many of the body's chemical reactions.
 2. Vitamin A is of concern in horse rations and may need to be supplemented to horses in growth stages and production.
 3. Rations are frequently recommended to be supplemented for horses being worked heavily.
 4. Over-supplementing some vitamins, such as B, does not harm a horse's body.
 5. Over-supplementing other vitamins, such as D, can be very harmful to the horse.

III. Nutrient sources

- A. Horses typically receive nutrients from grain, hay or pasture, or a combination of the three.
- B. Forage: All horses need long-stem forage at levels of 0.75 to 2 percent of body weight per day.
 1. Forages have a lower concentration of digestible energy than do grains.

RATION FORMULATION

Subject Matter Outline

2. Legumes have more energy per pound than do grasses.
 3. The type of grass and the stage of growth in which it is cut has a great effect on the nutrient content of the hay.
- C. Grains are considered a high-nutrient source, but differ in amounts of energy, crude protein, vitamins and minerals.
1. Most grains have six to eight times more phosphorus than calcium.
 2. Grains can be fed whole, coarsely processed or pelleted.
3. Coarse processing such as crimping or rolling increases digestibility of hard-seed-coated grains such as corn, but feeding fine-ground grains may lead to colic unless they are pelleted before feeding.
- D. Protein supplements are made up of by-products of the brewing industry and supplements from animal origins that provide amino acids deficient in grains and hays.
- E. Vitamins and minerals: Supplementation levels depend on what is being supplied by grains and forages; because most commercially prepared grain mixes are supplemented with vitamin and mineral premixes, additional supplementation is unnecessary.

1. *True or False: The nutrient concentration in rations for growing horses is recommended to be higher than for mature horses because of the combination of increased need and daily intake limits.*

True

2. *Should the nutrient requirements for growing and producing horses be more or less than a horse in a maintenance phase?*

The nutrient requirements should be more for growing and producing horses.

3. *What is the unit of measurement for energy?*

Megacalorie

4. *Why are amino acids necessary?*

Muscle deposition
Hormone synthesis

Enzyme synthesis
Other vital body processes

5. *For which amino acid are rations most commonly balanced?*

Lysine

6. *What are minerals important for?*

Development and maintenance of a strong skeletal system

7. *What are two minerals that rations are commonly balanced for?*

Calcium and phosphorus

8. *From what do horses get most of their vitamin requirements?*

Grains and forages

9. *What percentage of a horse's body weight should be included as a forage ration?*

0.75 to 2 percent

10. *What can processing do for hard seed-coated grains?*

Increase digestibility

11. *For what are protein supplements used?*

To provide amino acids deficient in grains and hays

12. *Name a vitamin that can harm a horse's health if it is over-supplemented.*

Vitamin D

13. *What is the calcium-to-phosphorus ratio in most grains?*

14.1:6 to 1:8

1. *True or False: The nutrient concentration in rations for growing horses is recommended to be higher than for mature horses because of the combination of increased need and daily intake limits.*
2. *Should the nutrient requirements for growing and producing horses be more or less than a horse in a maintenance phase?*
3. *What is the unit of measurement for energy?*
4. *Why are amino acids necessary?*
5. *For which amino acid are rations most commonly balanced?*
6. *What are minerals important for?*
7. *What are two minerals that rations are commonly balanced for?*
8. *From what do horses get most of their vitamin requirements?*
9. *What percentage of a horse's body weight should be included as a forage ration?*
10. *What can processing do for hard seed-coated grains?*
11. *For what are protein supplements used?*
12. *Name a vitamin that can harm a horse's health if it is over-supplemented.*
13. *What is the calcium-to-phosphorus ratio in most grains?*

PHYSICAL CONDITIONING

Subject Matter Outline

Youth should be able to:

- Define terms related to physical conditioning of the horse
- Discuss the general guidelines of equine physical conditioning
- Differentiate between aerobic and anaerobic workouts

I. Terminology

- A. *Exercise physiology* is the study of the horse's body in response to exercise, which includes the skeletal muscle, the blood and its circulation, and the cardiorespiratory system (heart and lungs).
- B. *Metabolic specificity* is the concept that those who want to be fast runners must train by running fast.
- C. *Glycogen* is a form of stored fuel for exercise of high intensity and relatively short duration. Glycogen does not require oxygen to be used as a fuel source during intense exercise.
- D. *Fatty acids* are the form of stored fuel used in exercise of low intensity and long duration. Fatty acids require oxygen if they are to be used as a fuel source.
- E. *Adenosine triphosphate (ATP)* and *creatine phosphate (CP)* are high-energy fuels used in short-term, high-intensity exercise of 30 seconds or less. They are collectively called the phosphagen system.
- F. *Lactic acid*, or *lactate*, is a by-product of anaerobic work and thought to be one of the causes of muscular soreness or stiffness.
- G. *Aerobic work* is exercise of relatively low intensity, such as walking, trotting and slow loping, during which glucose and fatty acids are the primary fuel. The horse's heart rate typically remains at fewer than 150 beats per minute.
- H. *Anaerobic work* is exercise of high intensity or long duration, such as short sprints or a fast gallop, during which glycogen, ATP and CP are the primary fuel source. It typically causes the horse's heart rate to be more than 150 beats per minute.
- I. *Anaerobic threshold* is the point in exercise at which lactate begins to accumulate in the muscle and spill over into the bloodstream.
- J. *Slow-twitch muscle fibers* are characterized by slow contraction and a large ability to use oxygen. Sometimes referred to as red fibers, they are best suited to low-intensity, long duration exercise.
- K. *Fast-twitch muscle fibers* are characterized by fast contraction. Called intermediate and white fibers, they are best suited to exercise of high intensity and relatively short duration.
- L. *Muscle fiber type distribution* is the percentage breakdown of red, white and intermediate fibers present.
- M. *VO₂ Max* is a measure of an individual's ability to use oxygen to sustain aerobic work. V=volume, O₂ =oxygen, and Max = maximum. Translation: VO₂ Max is the maximum volume of oxygen an individual can consume.
- N. *Muscle hypertrophy* is an increase in the diameter of individual muscle fibers.
- O. *Muscle hyperplasia* is an increase in the number of muscle fibers.

II. General guidelines

- A. Warm-up: The warm-up stretches and relaxes the muscles to allow for greater flexibility, increases muscle temperature, and increases blood flow to the muscles; activities include trotting, sidepassing, two-tracking, lunging and backing.
- B. Warm-down: Necessary immediately after exercise, the warm-down should consist of light work of decreasing intensity.
 1. The warm-down helps remove metabolic byproducts such as lactate from the muscle.
 2. It also prevents muscles from tightening up after exercise, minimizing soreness.
- C. Fatigue: Metabolic by-products build up and the muscle either runs out of fuel or is "poisoned" by harmful by-products.
 1. Muscle groups are recruited to perform a motion they are not principally designed to perform, increasing the chances of an injury.
 2. Such a build-up can be avoided by making the exercise less intense and allowing the horse to rest for a while.
- D. Chronic fatigue: Glycogen depletion in the muscle is a limiting factor in exercise.
 1. The intensity of exercise cannot be maintained when muscle glycogen falls below a certain level.
 2. Muscles require 26 to 46 hours to replenish glycogen stores.

III. Components of a training program

- A. The Long Slow Distance program (“legging up”) is used to condition a horse’s aerobic capacity.
 - 1. Legging up gives the horse the ability to recover from aerobic exercise.
 - 2. Such a program also strengthens and toughens bone, ligaments, tendons and cartilage.
 - 3. It needs to be done five to six times a week for 3 to 4 weeks.
 - 4. It can be accomplished by loping, galloping or ponying the horse.
- B. Interval training is the use of multiple bouts of work interspersed with relief intervals during which partial recovery is allowed.
 - 1. Interval training allows more total work to be done.
 - 2. It allows fatigue to be brought on gradually in a controlled manner.
 - 3. The horse should be worked up slowly into an interval training regime; “forcing” a horse into interval training can have disastrous effects if the horse cannot perform the prescribed exercise.

IV. Conditioning for specific events

- A. Mature halter horses should be prepared for competition
 - 1. Fitness or fatness: A certain amount of fat is necessary on a halter horse, but a fat horse may not be fit.
 - 2. Muscle volume can be increased through work that increases muscle hypertrophy.
 - a. A horse with a high percentage of fast-twitch (intermediate and white) muscle fibers will change more than one with an increased percentage of slow-twitch muscle fibers.

- b. Work loads should be of high intensity and medium to short duration.
 - B. Western Pleasure, Hunter Under Saddle, Western Riding, Working Horse, Hunter Hack and Trail events require aerobic types of work.
 - 1. These events are classified as low-intensity, long-duration work.
 - 2. These events require a horse to be aerobically fit.
 - C. Reining, Cutting, Working Low Horse, Roping, Barrel Racing, Pole Bending, Stakes Race and Open Jumping events require anaerobic types of work.
 - 1. All of these events create anaerobic work requiring maximal contractions of fast-twitch fibers.
 - 2. Nearly all of these events also contain aerobic components.
 - 3. They require that horses recover quickly.
 - 4. Both aerobic and anaerobic training are required.
 - a. Aerobic training requires low-intensity, long-duration work.
 - b. Anaerobic training intensity level varies by the event.
 - D. Racing, the most strenuous event, is primarily anaerobic.
 - 1. Racing has little or no aerobic component, and therefore offers no chance for metabolic recovery.
 - 2. Long Slow Distance training is required to increase the horse’s aerobic fitness.
 - 3. After the LSD or “legging up” phase, interval training works well for racehorse conditioning.

1. *True or False: In an aerobic workout, the horse's heartbeat should exceed 150 beats per minute.*

False

2. *What is muscle hypertrophy?*

An increase in the diameter of the individual muscle fibers

3. *List five good warm up exercises for a horse.*

Trotting	Sidepassing
Two-tracking	Longing
Backing	

4. *Give three reasons for warming up a horse.*

Stretches and relaxes muscles, allowing for increased flexibility
Increases muscle temperature
Increases blood flow to muscles

5. *Give two reasons for a warm-down on a horse after exercise.*

Removes metabolic by-products from muscles
Prevents muscles from tightening up after exercise

6. *List the benefits of Long Slow Distance training.*

Conditions the horse for quick recovery from aerobic exercise
Strengthens bones, ligaments, tendons and cartilage

7. *List two advantages of interval training.*

Allows for more total work to be done
Allows for fatigue to be brought on gradually and in a controlled manner

8. *What type of work load would one use to condition a mature halter horse?*

High intensity, of short to medium duration

9. *True or False: Racing is primarily an aerobic type of workout.*

False

1. *True or False: In an aerobic workout, the horse's heartbeat should exceed 150 beats per minute.*

2. *What is muscle hypertrophy?*

3. *List five good warm up exercises for a horse.*

4. *Give three reasons for warming up a horse.*

5. *Give two reasons for a warm-down on a horse after exercise.*

6. *List the benefits of Long Slow Distance training.*

7. *List two advantages of interval training.*

8. *What type of work load would one use to condition a mature halter horse?*

9. *True or False: Racing is primarily an aerobic type of workout.*

MONITORING FITNESS BY HEART RATE

Subject Matter Outline

Youth should be able to discuss:

- The cardiovascular system and its function
- General guidelines of the heart rate as it pertains to exercise level

I. Introduction

- A. Cardiovascular fitness is of prime importance for the horse to use the other body systems efficiently.
- B. The cardiovascular system (CVS) is easily monitored by measuring the heart rate before, during and after exercise.

II. Function

- A. The primary function of the CVS is to deliver blood to the muscles.
- B. Energy sources and oxygen are two important components of blood needed for muscle activity.
- C. The CVS also must remove by-products of energy metabolism, such as carbon dioxide and lactate, from muscles.
- D. The heart rate (number of times the heart beats per minute) is driven by oxygen and carbon dioxide levels in the blood.
 1. Exercising muscles need more oxygen during and while recovering from muscular activity.
 2. Elevated heart rates allow for the removal of much of the carbon dioxide produced during muscular activity.

III. Parameters

- A. The normal resting heart rate of a mature horse is between 30 and 40 beats per minute.
- B. Fitness does not appear to appreciably change the resting heart rate of horses.
- C. A heart rate below 150 to 170 beats per minute characterizes aerobic exercise, which uses energy supported by oxygen and uses fatty acids and blood glucose as fuel sources.
- D. A heart rate of 170 beats per minute or more characterizes metabolism occurring anaerobically or without oxygen; the fuel sources for anaerobic metabolism are glucose and glycogen.
- E. The maximal heart rate in mature horses appears to be between 220 and 260 beats per minute.

IV. Monitoring

- A. A simple, low-cost method is to feel the digital or mandibular pulse by placing a finger on the posterior digital or facial artery as it traverses underlying skeletal structures.
- B. A stethoscope can monitor heart rate more consistently if it is placed along the heartgirth behind the left elbow of a horse's body.
- C. The most reliable way to determine heart rate is with an electrical monitor, which measures the heart's electrical impulses and converts them into a digital number.

V. Heart rate as an indicator of health

- A. When exercise begins, the heart rate usually increases rapidly to very elevated levels.
 1. This "overshoot" response is caused by the release of the hormone epinephrine into the blood.
 2. This initial increased heart rate usually lasts for 1 to 2 minutes.
 3. The heart rate in early exercise is not a good indication of work level or fitness.
- B. During Long Slow Distance training (the "legging up" phase), the horse is performing aerobic work
 1. During this phase, the horse's speed and duration of exercise should allow for a steady heart rate below 150 to 170 beats per minute.
 2. A horse in good fitness has a recovery heart rate of about 100 beats per minute at 2 minutes post exercise.
 3. Recovery heart rate at 10 minutes post exercise should be less than 60 beats per minute.
- C. During the "breezing" phase (speed work) of exercise, a horse is expected to have a heart rate of more than 170 to 190 beats per minute; this horse is performing anaerobic work.
 1. If the heart rate rises above 190 beats per minute, reduce the speed of exercise.
 2. If the recovery heart rate is below 120 beats per minute at 2 minutes post exercise and below 70 beats per minute at 10 minutes post exercise, the horse is likely to be conditioned adequately for that level of exercise.

MONITORING FITNESS BY HEART RATE

Subject Matter Outline

- D. In interval training during the sharpening phase, horses are worked at near maximum heart rates using sprints interspersed with relief periods.
1. Heart rate monitors are needed to monitor the horse.
 2. The heart rate can be expected to be well over 170 to 190 beats per minute when the horse is sprinting and should drop below 120 beats per minute during the relief interval.
 3. Discontinue this exercise if the heart rate does not drop to 130 to 140 beats per minute within 2 minutes.

- E. Monitor the heart rate to detect early signs of injury.
1. As a horse becomes more fit, its heart rate at a consistent speed decreases.
 2. An injury probably has occurred if the heart rate increases sharply during a specific exercise bout.
 3. An elevated heart rate may also indicate chronic fatigue or overtraining.
- F. Record keeping is a must if heart rate monitoring is to be used as an indication of fitness.
1. An individual can be compared with others over time.
 2. An individual's progress in successive workouts can be charted.

1. *What is the primary function of the CVS?*

To deliver blood to muscles

2. *Name two components of blood needed for muscle activity.*

Energy sources

Oxygen

3. *What is a normal resting heart rate of a mature horse?*

30 to 40 beats per minute

4. *Aerobic exercise is characterized by a heart rate of (a.) _____, and anaerobic exercise is characterized by a heart rate of (b.) _____.*

(a.) 150 to 170 beats per minute

(b.) More than 170 beats per minute

5. *What is a maximal heart rate in a mature horse?*

220 to 260 beats per minute

6. *What is the most reliable way to determine heart rate?*

Electrical monitoring

7. *True or False: In early exercise, heart rate is a good indicator of work level or fitness.*

False

8. *If a fit horse is exercising aerobically (heart rate = 150 to 170 beats per minute), what should its heart rate be at (a.) 2 minutes post exercise? (b.) 10 minutes post exercise?*

(a.) 100 beats per minutes

(b.) 60 beats per minute

MONITORING FITNESS BY HEART RATE

1. *What is the primary function of the CVS?*
2. *Name two components of blood needed for muscle activity.*
3. *What is a normal resting heart rate of a mature horse?*
4. *Aerobic exercise is characterized by a heart rate of (a.) _____, and anaerobic exercise is characterized by a heart rate of (b.) _____.*
5. *What is a maximal heart rate in a mature horse?*
6. *What is the most reliable way to determine heart rate?*
7. *True or False: In early exercise, heart rate is a good indicator of work level or fitness.*
8. *If a fit horse is exercising aerobically (heart rate = 150 to 170 beats per minute), what should its heart rate be at (a.) 2 minutes post exercise? (b.) 10 minutes post exercise?*

CONTROLLING HAIR LENGTH USING EXTENDED DAY LENGTH REGIMES

Subject Matter Outline

Youth should be able to:

- Discuss the effect of light on hair growth in horses
- Outline a plan to keep horse hair growth to a minimum through winter months

I Introduction

- A. Traditional procedures for maintaining short hair or shedding hair from horses have involved keeping horses hooded and blanketed in heated barns, which can be very expensive.
- B. Keeping horses in warm barns, then taking them outside in cold temperatures for exercise may cause health problems.
- C. To minimize these problems, a horse owner should consider using extended day length regimens to control hair length in horses.

II. Theory

- A. Photoperiod (day length) is a major factor governing hair growth in horses.
 - 1. June 21 is the longest day, with 16 hours of daylight.
 - 2. December 21 is the shortest day, with 10 hours of daylight.
- B. The theory is simple: Mechanically provide horses 16 hours of daylight during fall and winter to mimic the natural spring and summer day length.
- C. This procedure retards fall hair growth and causes premature shedding if a horse has grown a winter hair coat.
- D. Research has been conducted on extended vs. traditional day length regimens for controlling hair length in horses.
 - 1. Two groups of horses were used: ED, extended day length, and NED, non-extended day length.
 - 2. All the horses were housed in the same nonheated barn and none of the horses was blanketed.
 - 3. The hair under the mane was clipped to the skin on both groups to have an equal measuring area.
 - 4. As the natural day length shortened through November and into December, the hair on the NED group

continued to grow longer, and the hair growth on the ED group was retarded.

- 5. On the last day of the experiment, the hair on the NED group was almost three times longer than that of the ED group.

III. Light

- A. Use incandescent (clear or frosted) or fluorescent bulbs, not colored or heated lamps, over or close to a horse's stall.
- B. A 200-watt incandescent bulb located about 10 feet above the floor in a 12-by 12-foot stall provides appropriate amount of light.

IV. Timers

- A. Two types of timers are usually used.
 - 1. A box timer can be mounted between the power source and the bulb to turn the lights on/off mornings and nights.
 - 2. A receptacle timer plugs into a wall outlet with a treble light plugged into the unit that turns individual lights on/off mornings and nights.
- B. The cost can range from \$45 to \$15.

V. Procedure

- A. Horses should receive 16 hours of continuous light of appropriate intensity with 8 hours of darkness each day.
- B. Light can be added to either end of the day, or both.
- C. Most horse owners add light both in the morning and evening, which complements barn work schedules.

VI. Results

- A. In the fall when horses are put under an extended lighting regimen, hair growth will be retarded.
- B. If put under lights in winter, the hair coat should start to slip within about 45 days, with another 60 days required for the horse to shed completely.
- C. In colder weather, a blanket or hood may be necessary to keep the horses comfortable.

CONTROLLING HAIR LENGTH USING EXTENDED DAY LENGTH REGIMES

Q&A

1. *Name one major factor governing hair growth in horses.*

Day length or photo period

2. *Name two types of bulbs appropriate for providing light to horses.*

Incandescent (clear or frosted)

Fluorescent

3. *How many hours of darkness should a horse receive daily to minimize hair growth?*

8 hours

4. *Should light be added in the morning or evening?*

It makes no difference.

5. *If put under lights in winter, how long will it take a horse to begin shedding its hair coat?*

45 days

CONTROLLING HAIR LENGTH USING EXTENDED DAY LENGTH REGIMES

Work Sheet

1. *Name one major factor governing hair growth in horses.*
2. *Name two types of bulbs appropriate for providing light to horses.*
3. *How many hours of darkness should a horse receive daily to minimize hair growth?*
4. *Should light be added in the morning or evening?*
5. *If put under lights in winter, how long will it take a horse to begin shedding its hair coat?*

NUTRITIONAL MANAGEMENT OF PREGNANT AND LACTATING MARES

Subject Matter Outline

Youth should be able to:

- Discuss the nutritional needs of pregnant and lactating mares

I. Introduction

- Economic survival often hinges on mares foaling early in the year, rebreeding quickly and nursing a growing foal that develops soundly.
- Broodmares have specific nutritional requirements that differ from other classes of horses; they differ in nutrient concentration and in the amount of feed.

II. Body condition

- Mares with condition scores of less than 5 perform less well reproductively than do mares with scores higher than 5.
- Moderately fleshy to fat mares can be expected to cycle earlier in the year, have fewer cycles per conception, have a higher pregnancy rate, and maintain pregnancy more easily than thin mares.
- Mares in marginal condition are more likely to skip a breeding season and their bodies to use dietary nutrients primarily for milk rather than reproduction.

III. Importance of roughage

- Roughage minimizes digestive problems such as colic or founder and discourages undesirable vices such as cribbing and tail chewing.
- Some types of grazing and hay can be health hazards for brood mares.
 - Sorghums and sudans have been reported to cause cystitis syndrome (prussic acid poisoning).
 - Alfalfa hay sometimes contains blister beetles, which are also poisoning.
 - Fescue can contain endophyte fungus, which can lead to total absence of milk production (agalactia).
- To provide a safe and effective foundation for the brood mare feeding program, select hay on the basis of leafiness, cleanliness, aroma and color.

IV. Concentrate feeds

- Commercially prepared feeds are practical for feeding a few horses.
- Owners with many of brood mares may find it practical to have a store or company custom-mix a ration that can be delivered in bulk loads.

- If you buy individual grains for mixing, use only the highest quality.

- Inferior corn grain can contain the mycotoxin *Fusarium moniliforme*, which causes leucoencephalomalacia (moldy corn poisoning).
- Do not use grain feeds that contain corn by-products.
- Do not feed corn screenings.

- Complete feeds are sources of concentrate and roughage together.

- They are high in fiber and low in digestible energy.
- Mares will consume them more slowly, making it possible to feed free choice.

- Cattle feeds can be used to good benefit.

- Horses can tolerate about the same level of urea in their diets as cattle.
- Make sure that any cattle feeds fed to horses contain absolutely no mold or additives such as Bovatec or Rumensin.

V. Total feed intake

- The total feed intake by mares normally ranges from 1.5 percent to 3.0 percent of body weight.

- Mares in early to mid gestation have nutrient requirements similar to those of a mature idle horse.

- Mares in late gestation require more nutrients because the unborn foal is growing more rapidly.

- They do not need more total feed intake, but a higher concentration of protein, energy, calcium, phosphorus and vitamin A.
- Most fetal growth occurs in the last 4 months of gestation.
- Feed-grade rendered fat can be incorporated into the concentrate to increase the grain feed's energy content.

- Feeding fat improves body condition without having to feed too much concentrate every day.

- Lactating mares require more nutrients in larger amounts of feed.

- To prevent founder, gradually increase the daily feed intake compared to that needed during gestation.
- Daily requirements decline in the fourth, fifth and sixth months of lactation.

NUTRITIONAL MANAGEMENT OF PREGNANT AND LACTATING MARES

Q&A

1. *Mares with a condition score higher than _____ have better reproduction performance than those having a lower score.*

5

2. *In percentage body weight, what is the range for total feed intake for mares?*

1.5 to 3.0 percent

3. *Name two vices that can be minimized by feeding adequate roughage.*

Cribbing and tail chewing

4. *Sorghums and sudans are associated with what type of poisoning?*

Prussic acid poisoning

5. *Why would a mare in late gestation require additional nutrients?*

Because of the rapid growth of the unborn foal she is carrying

NUTRITIONAL MANAGEMENT OF PREGNANT AND LACTATING MARES

Work Sheet

1. *Mares with a condition score higher than _____ have better reproduction performance than those having a lower score.*
2. *In percentage body weight, what is the range for total feed intake for mares?*
3. *Name two vices that can be minimized by feeding adequate roughage.*
4. *Sorghums and sudans are associated with what type of poisoning?*
5. *Why would a mare in late gestation require additional nutrients?*

MANAGING AND MANIPULATING THE MARE'S REPRODUCTIVE CYCLE

Subject Matter Outline

Youth should be able to:

- Identify management techniques for manipulating the mare's reproductive cycle
- Discuss photo period manipulation as a breeding management tool
- Discuss hormone manipulation as a breeding management tool

I. Problems for the horse breeder

- A. The mare has a relatively long estrus.
- B. The time of ovulation varies in relation to estrus.
- C. The universal Jan. 1 birth date has imposed a restricted breeding season on the horse.

II. Extended day light

- A. The mare is a seasonal breeder that cycles regularly during the long-day parts of the year.
- B. The mare cycles in response to the amount of light she perceives.
- C. It is possible to manipulate the mare's natural cyclicity to the time of year.
 1. To have a mare cycle in February, she must be exposed to an extended daylight regime for about 60 days beforehand.
 2. The most common practice is to expose the mare to 16 hours of light and 8 hours of darkness beginning in mid to late November.
 3. For the desired response, the amount of light should be equivalent to the amount necessary to read a newspaper in the area.
 4. Temperature does not affect a mare's responsiveness to light.

III. Nutrition

- A. Mares conceive more readily and maintain pregnancies more consistently if they enter the breeding season in a high level of body condition than if they are thin.

IV. Hormonal treatments

- A. Three classes of hormonal treatments are used to manage and manipulate the mare's estrous cycle to improve her reproductive efficiency: prostaglandins, gonadotropins and steroids.
- B. Prostaglandin, which cause the corpus luteum to regress, is used in three situations.
 1. It is used for postpartum mares that do not meet all the prerequisites for foal heat breeding.
 2. It is used when a mare arrives at a breeding farm shortly after ovulation.

3. It is used to shorten the interval from one ovulation to the next.

C. Gonadotropin-like hormones are used for three reasons.

1. They hasten ovulation and decrease inseminations.
2. They treat persistent follicles.
3. They manage possible twin follicles.

D. Steroids keep a mare out of estrus.

1. Progesterone is a steroid; the most commonly used product is altrenogest (Regumate).
2. Regumate is used early in the breeding season along with an extended lighting program, which allows for scheduled breeding.
3. Maintaining a pregnancy using steroids is still controversial.

V. Restricted nursing also can stimulate ovarian activity in mares experiencing lactational anestrus.

VI. Pregnancy determination

1. Good breeding-farm managers use all available techniques.
2. Teasing is most useful and economical detection tool.
3. If the mare does not return to estrus in 18 to 20 days, then there is a good chance she is pregnant.
4. Rectal palpation can detect pregnancy at 18 to 21 days.
5. Ultrasonography can detect pregnancy at 10 to 11 days post ovulation.
6. Follow-up detection is necessary at 25 to 35 days after breeding.
7. Blood serum assay is another technique.
 - a. Pregnant mare serum gonadotropin (PMSG) levels are checked to determine pregnancy.
 - b. The test is run at 45 days of pregnancy.
 - c. It is not usually used because of techniques and the time factor.

VII. Other factors that may affect conception

- A. Infection of the uterus may have occurred.
- B. A Caslick suture can decrease the possibility of reinfection.
- C. A uterine biopsy can determine if course of action, if needed to assist a mare in regaining uterine health.
- D. A twin pregnancy can cause an abortion of the embryos. A manager has three options:
 1. Do nothing and hope natural processes occur.
 2. Abort the pregnancy before day 30 and start over.
 3. Try a manual reduction, leaving one embryo.

MANAGING AND MANIPULATING THE MARE'S REPRODUCTIVE CYCLE

Q&A

1. *True or False: The mare is a seasonal breeder.*

True

2. *An extended daylight program must be initiated how many days before desired breeding?*

60 days

3. *What effect does temperature have on a mare's responsiveness to an extended daylight program?*

None

4. *True or False: The body condition of a mare entering the breeding season is very important.*

True

5. *Name three classes of hormones used to manipulate the mare's reproductive cycle.*

Prostaglandins
Steroids

Gonadotropins

MANAGING AND MANIPULATING THE MARE'S REPRODUCTIVE CYCLE

Work Sheet

1. *True or False: The mare is a seasonal breeder.*
2. *An extended daylight program must be initiated how many days before desired breeding?*
3. *What effect does temperature have on a mare's responsiveness to an extended daylight program?*
4. *True or False: The body condition of a mare entering the breeding season is very important.*
5. *Name three classes of hormones used to manipulate the mare's reproductive cycle.*

USING ULTRASONOGRAPHY IN BREEDING MANAGEMENT

Subject Matter Outline

Youth should be able to discuss:

- The advantages of ultrasonography
- Uses of ultrasound in a breeding program

I. Introduction

- A. Ultrasonography of the mare's reproductive tract has proven to be a very useful tool to help breeding farm managers and veterinarians to diagnose the reproductive status.
- B. Ultrasonography was first used as a breeding management tool for detecting pregnancy.
- C. Ultrasound scanning is extremely useful in examining the nonpregnant mare.

II. Detection

- A. Uterine abnormalities can be identified by retention of fluids and endometrial cysts.
- B. It is possible to detect follicles, ovulation of previous follicles, or failure of those follicles to ovulate.
- C. Pregnancy can be detected at an earlier stage (10 to 11 days) and its progress can be seen and measured.
- D. The fetal heartbeat is detectable around 22 to 24 days of gestation and is considered a good indicator of embryo viability.

III. Conclusion

- A. For its benefits to be fully realized, it is important for ultrasound to be used in conjunction with other management tools.

1. *Name two uterine abnormalities that can be identified using ultrasonography.*

Fluid retention
Endometrial cysts

2. *For how many days after breeding can pregnancy be detected using ultrasound?*

10 to 11 days

3. *At what stage is a fetal heartbeat detectable using ultrasound?*

22 to 24 days of gestation

4. *Regarding ovulation, list three uses of ultrasound in a nonpregnant mare.*

Follicle detection
Ovulation of previous follicles
Failure of follicles to ovulate
Detection of Corpus Luteum
Persistence of Corpus Luteum

USING ULTRASONOGRAPHY IN BREEDING MANAGEMENT

Work Sheet

1. *Name two uterine abnormalities that can be identified using ultrasonography.*
2. *For how many days after breeding can pregnancy be detected using ultrasound?*
3. *At what stage is a fetal heartbeat detectable using ultrasound?*
4. *Regarding ovulation, list three uses of ultrasound in a nonpregnant mare.*

ANATOMY AND PHYSIOLOGY OF THE MARE'S REPRODUCTIVE SYSTEM

Subject Matter Outline

Youth should be able to:

- Identify the components of the mare's reproductive system
- Discuss the estrous cycle of the mare

I. Introduction

- A. A breeder must be familiar with what is normal and abnormal in order to detect problems early in the breeding season and to prevent them from becoming serious.
- B. To achieve a successful breeding program, the stallion manager and mare owner should have a basic understanding of the mare's reproductive system.

II. Anatomy

- A. The ovum or germ cell is produced and nurtured in the ovary until it is ovulated or released into the oviduct.
- B. The ovary is located between the last rib and hip bone in the nonpregnant mare and deeper in the pregnant mare because of the enlarging uterine contents.
- C. The active ovary will go through four structures.
 1. The follicle is a fluid-filled blister that develops on the ovary surface.
 - a. The follicle serves to protect and maintain the growing ovum (egg).
 - b. It also produces estrogen, the excitatory female sex hormone.
 2. The corpus hemorrhagicum is a small hemorrhage or blood clot that forms after ovulation.
 3. The corpus luteum (yellow body) produces the hormone progesterone.
 4. The corpus albicans is the connective tissue that appears on the ovary at the site of the corpus luteum.
- D. The oviduct is the site of fertilization and transports the fertilized egg to the uterus; its three parts are the infundibulum, ampulla and isthmus.
- E. The uterus serves as an incubator for the developing fetus.

- F. Estrogen, progesterone and prostaglandin influence the tone or turgidity of the uterus.
- G. The cervix separates the uterus from the vagina and controls the entrance of materials into the uterus.
- H. The vagina connects the cervix and the vulva.
 1. It receives the penis during copulation.
 2. It also serves as the passageway for the foal during birth.
- I. The vulva is the external portion of the mare's reproductive tract.
 1. Wind suckers occur when the vulva lips lose their muscle tone and become loose and pliable.
 2. Caslick sutures may be used to keep foreign matter from entering the tract and becoming infected.

III. Physiology and endocrinology

- A. The mare is a seasonally polyestrous breeder with heat periods beginning in the spring.
- B. Mares under natural light show signs of heat in March and ovulate in late March.
- C. The estrous cycle is the interval from one ovulation to the next, which is 22 days.
 1. Estrus (heat) is the period when the mare is receptive to the stallion.
 2. Ovulation occurs 24 to 48 hours before the end of estrus.
 3. Estrus usually lasts from 3 to 7 days.
 4. Diestrus is the period when the mare is unreceptive to the stallion.
- D. Estrous detection is performed by teasing the mare with a stallion and by observing the mare for signs of behavioral estrus; these signs include tail raising, squatting, and urinating and winking of the vulva.

1. *What are three signs of behavioral estrus in the mare?*

Tail raising
Urinating and winking of the vulva

Squatting

2. *What are the two major stages of the estrous cycle?*

Estrus

Diestrus

3. *List the three parts of the oviduct.*

Infundibulum
Isthmus

Ampulla

4. *List the four structures an active ovary will cycle through.*

Follicle
Corpus luteum

Corpus hemorrhagicum
Corpus albicans

5. *List three hormones associated with the reproductive cycle of the mare.*

Estrogen
Prostaglandin

Progesterone

6. *What are the functions of the oviduct?*

Serves as the site of fertilization
Transports fertilized egg to the uterus

7. *What is the function of the cervix?*

Separates the uterus from the vagina and controls the entrance of materials into the uterus

8. *What purpose do Caslick sutures serve?*

Reduce the amount of foreign matter entering the reproductive tract

ANATOMY AND PHYSIOLOGY OF THE MARE'S REPRODUCTIVE SYSTEM

Work Sheet

1. *What are three signs of behavioral estrus in the mare?*
2. *What are the two major stages of the estrous cycle?*
3. *List the three parts of the oviduct.*
4. *List the four structures an active ovary will cycle through.*
5. *List three hormones associated with the reproductive cycle of the mare.*
6. *What are the functions of the oviduct?*
7. *What is the function of the cervix?*
8. *What purpose do Caslick sutures serve?*

GESTATION, FOALING AND NEONATAL CARE

Subject Matter Outline

Youth should be able to:

- Identify critical events before, during and after birth
- Discuss the process of parturition

I. Introduction

- A. The ultimate goal of a horse breeder is to produce a live, healthy foal and to maintain the health and breedability of the mare.
- B. Because life-threatening complications can arise, owners must completely understand the process of gestation and parturition.

II. Gestation

- A. Gestation is the period from fertilization to parturition.
- B. Gestation varies from 305 to 365 days long, with 340 days being average.
 1. The season of breeding can affect the length of gestation; spring breedings are 1 to 2 weeks longer.
 2. The sex of the foal can also affect the length of gestation, with colts being carried longer than fillies.
- C. Physical changes in the mare signal the approach of birth.
 1. In the weeks prior to birth, the croup muscles and pelvic ligaments relax some.
 2. For 24 to 48 hours prior, there is more pronounced relaxation, particularly around the vulva and tail head.
 3. For 24 to 48 hours prior, the foal “drops” and the mare’s profile changes from wide and shallow to narrow and deep.
 4. Just prior to birth, the udder becomes distended and the teats wax.

III. Parturition

- A. Parturition (foaling) is the act giving birth.
- B. More than 80 percent of mares give birth at night.
- C. Parturition is divided into 3 stages: preparation, birth and placental passage.
 1. During preparation, the mare’s cervix dilates; the mare shows signs of physical discomfort; and the foal rotates into the dorsal position.
 2. Birth begins with the release of 2 to 5 gallons of fetal fluid (“water breaking”); the foal’s front feet should appear within 5 to 10 minutes, with the nose being next.
 - a. The actual birth lasts from 5 to 20 minutes.
 - b. Any variation from normal presentation should be treated as a medical emergency.
 3. Placental passage lasts about an hour; the mare may remain lying for 10 to 15 minutes, allowing for rest and time for the placental blood to transfer to the foal.
 4. The placenta is classified as retained if it is not passed within 2 to 4 hours.

IV. Postpartum care

- A. Foals should stand on their own within 2 hours of birth.
- B. Treat the naval stump with a 7 to 2 percent aqueous iodine solution.
- C. While the naval stump is being treated, an intramuscular or subcutaneous tetanus antitoxin should be injected.
- D. The foal should nurse within 2 to 3 hours of birth to obtain temporary immunity to diseases by drinking the mare’s colostrum (first milk).
- E. Be certain that the meconium is passed so that the foal does not become impacted.

1. *What is the average gestation length in a mare?*
2. *True or False: The sex of the foal can affect the length of gestation.*
3. *List two changes that generally occur 24 to 48 hours before a mare gives birth.*
4. *What is parturition?*
5. *More than what percentage of mares give birth at night?*
6. *List the three stages of parturition.*
7. *Within how long from birth should a foal stand on its own?*
8. *A foal should nurse within _____ of birth.*
9. *What is the name of the mare's first milk?*

MINIMIZING WEANING STRESS IN FOALS

Subject Matter Outline

Youth should be able to:

- Identify ways to minimize weaning stress in foals

I. Introduction

- To be competitive, young horses must be as mature, healthy and as sound as genetically possible when conditioning and training.
- A critical time in a the developmental process is the weaning period.

II. Weaning period

- Weaning occurs at 5 to 6 months old.
- Foals receive nourishment from milk, and security by touching, hearing, seeing and smelling their mothers.
- During weaning, changes in the environment can be very stressful to foals.

III. Minimizing stress

- Implement health programs: Start foals on a foal health program before weaning; deworm at 4 to 6 weeks old; immunize at 2 to 3 months old.
- Creep feed foals: Provide creep feed (16 to 18 percent crude protein) at 2 to 3 months old.
- Monitor mare feeding: Limit or omit the mare's concentrate 7 to 10 days preweaning to decrease the foal's dependence on the mother's milk.
- Use safe weaning facilities that enable foals to see, smell and hear their mothers.
- Develop a separation plan: Separate foals from their mothers so that foals can't nurse at weaning time.

1. *At what age should a foal be weaned?*

5 to 6 months old

2. *What percentage of crude protein should creep feed contain?*

16 to 18 percent

3. *At what age should foals be dewormed?*

4 to 6 weeks old

4. *At what age should a foal be immunized?*

2 to 3 months old

5. *What are the major steps to minimize weaning stress in foals?*

Implement health programs.

Creep feed foals.

Monitor mare feed.

Use safe weaning facilities.

Develop a separation plan.

MINIMIZING WEANING STRESS IN FOALS

Work Sheet

1. *At what age should a foal be weaned?*
2. *What percentage of crude protein should creep feed contain?*
3. *At what age should foals be dewormed?*
4. *At what age should a foal be immunized?*
5. *What are the major steps to minimize weaning stress in foals?*

PSYCHOLOGICAL PRINCIPLES FOR TRAINING YOUNG FOALS

Subject Matter Outline

Youth should be able to:

- Discuss the advantages of handling young foals
- Describe some methods of handling young foals

I. Introduction

- A. Handling a foal early in life will lessen the trauma and reduce injuries at weaning time.
- B. Handling can also increase a foal's ability to learn later in life.

II. Less trauma

- A. Short periods away from the mother followed by periods of comfort and security with the mother tend to condition both the mother and foal to be alone.
- B. A fundamental principle of behavior is that if you change the environment in small enough increments, the organism never notices the change.

III. Fewer injuries

- A. Early handling helps reduce injuries as the young foal learns about the world.

- B. First, handle the foal several times in the presence of its mother.
- C. When haltering, let the foal learn to make choices as well as learn the consequences of making the wrong one.
- D. Start halter breaking before weaning, then follow with activities limited only by the horse's physical capabilities.
- E. Brush and rub foals and pick up their feet to ensure that they are truly gentle.

IV. Effects on learning

- A. An animal's ability to learn, solve problems and survive the effects of a severe stress has been shown to be greatly influenced by the characteristics of its environment during early life.
- B. Horses today are more docile, intelligent and obedient than those 30 years ago.
- C. Some of this change is because of heredity, but it can be credited to increased handling of horses at earlier ages.

1. *Why is it helpful to handle a foal at an early age?*

It can help reduce injuries at weaning time.

2. *True or False: Early handling can increase an animal's ability to learn.*

True

PSYCHOLOGICAL PRINCIPLES FOR TRAINING YOUNG FOALS

Work Sheet

1. *Why is it helpful to handle a foal at an early age?*

2. *True or False: Early handling can increase an animal's ability to learn.*

PHYSIOLOGY AND MANAGEMENT OF THE STALLION

Subject Matter Outline

Youth should be able to:

- Identify components of the stallion's reproductive system
- Discuss management strategies to ensure a stallion's peak reproductive efficiency

I. Introduction

- A. To perform at an optimum level of efficiency, a stallion should be managed carefully year-round.
- B. Basic management includes a proper feeding program, vaccination program, shoeing schedule and exercise regimen.

II. Anatomy and physiology

- A. The scrotum is composed of four layers of tissue that house and protect the testes, epididymis and spermatic cords.
- B. The testes make up the main structure in the scrotum, which is the site of production of both the male gamete spermatozoa and the predominant male sex hormone.
- C. The epididymis houses the maturation process of spermatazoa.
- D. The spermatic cord suspends the testis in the scrotum as it extends into the abdominal cavity.
- E. The urethra is the site of ejaculation of semen and seminal plasma; it also is the route for urine.
- F. The penis is the male organ of copulation; it is classified as a vascular type.

- G. The semen can be divided into three fractions: pre-sperm, sperm rich and gel fraction.
- H. Ejaculation is noted in the stallion by "flagging" of the tail.
- I. The condition known as cryptorchid testis is when the testis fails to drop into the scrotum.
- J. A stallion reaches peak production between 6 and 10 years old.

III. Management

- A. A sperm cell takes 61 days to be ready for ejaculation.
- B. If a stallion's health is affected at any time, his sperm will also be affected.
- C. Fever, stress, poor nutrition and very cold temperatures can all affect sperm production and must be considered before the breeding season.
- D. The horse is a long-day breeder; reproductive function begins as the days lengthen.
- E. Exposing a stallion to 16 hours of light a day for 45 to 60 days before the breeding season induces reproductive function earlier in the season.

IV. Breeding soundness evaluation

- A. At the beginning of every breeding season, a stallion should undergo a breeding soundness evaluation.
- B. The evaluation includes testicular size, breeding history, age of the stallion, behavior and libido, mounting ability, soundness of hindquarter and semen evaluation.

1. *What is cryptorchidism?*

When one or both of the testes fail to descend into the scrotum

2. *Name the three fractions of the semen.*

Pre-sperm
Gel fraction

Sperm rich

3. *What outward physical characteristic signifies that ejaculation has occurred?*

“Flagging” of the tail

4. *How many days are required for a sperm cell to reach maturation?*

61 days

5. *What should a stallion undergo before the start of each breeding season?*

A breeding soundness evaluation

6. *At what age does a stallion reach its reproductive peak?*

Between 6 and 10 years

1. *What is cryptorchidism?*
2. *Name the three fractions of the semen.*
3. *What outward physical characteristic signifies that ejaculation has occurred?*
4. *How many days are required for a sperm cell to reach maturation?*
5. *What should a stallion undergo before the start of each breeding season?*
6. *At what age does a stallion reach its reproductive peak?*

PRESERVATION OF STALLION SEMEN

Subject Matter Outline

Youth should be able to discuss:

- The advantages and disadvantages of cryopreservation of stallion semen
- The process of cryopreservation

I. Introduction

- A. Cryopreservation, or freezing of stallion semen, can be useful in equine reproduction.
- B. The first pregnancy from frozen stallion semen was reported in 1975.
- C. Frozen equine semen has not been widely used in the United States because breed registries have imposed restrictions, and because the pregnancy rates achieved are lower than acceptable.

II. Advantages

- A. It is cheaper to ship a nitrogen container carrying straws of frozen semen than to transport a horse.
- B. It is less stressful for both stallion and mare with higher pregnancy rates
- C. Stallions can participate in other events without interrupting the breeding season.
- D. Semen can be stored and used even after the stallion has died.
- E. It reduces the use of genetically inferior stallions.

III. Disadvantages

- A. Too many mares are bred to an individual stallion, and income is reduced for some stallion owners.

- B. Current techniques for semen cryopreservation produce an unsatisfactory pregnancy rate.

IV. Sperm characteristics required to fertilize an egg

- A. Normal metabolism must be occurring for production of energy.
- B. Progressive motility is necessary.
- C. Enzymes must be located within the head of the spermatazoa to allow the spermatazoa to penetrate the structures surrounding the egg
- D. Proteins must be available to help the sperm survive in the female reproductive tract and attach to the egg at fertilization.

V. Cryopreservation

- A. Cryoprotective agents must be added to the seminal extender to aid survival through the freeze-thaw process. Glycerol is the most common seminal extender.
- B. Semen is cooled to minus 196 degrees C and the straws are then stored in a nitrogen tank or freezer.
- C. Use thawed semen immediately to breed the mare.
- D. Cooling the stallion semen also helps preserve it.
- E. Cooled semen is usually transported in an Equitainer.
- F. Equitainers store the semen at 4 to 8 degrees C for 30 to 60 hours.

1. *To what temperature is stallion semen cooled for shipping?*

Minus 196 degrees C

2. *What year was the first pregnancy from frozen stallion semen reported?*

1975

3. *What characteristics must sperm maintain in order to fertilize and egg?*

Normal metabolism

Progressive motility

Enzymes within the head of the spermatozoa that allow the spermatozoa to penetrate the structure surrounding the egg

Protein that helps the sperm survive in the reproductive tract

4. *List some advantages of cryopreservation of stallion semen.*

Cheaper to ship semen than to transport a horse

Less stressful for both the stallion and the mare

Stallion can be used for other activities without interrupting breeding season

Semen can be stored and used after the stallion has died

Reduces the use of genetically inferior stallions

5. *What is the specific name of the container used to ship cooled semen in?*

Equitainer

6. *What is the most common seminal extender to aid survival through the freeze/thaw process?*

Glycerol

PRESERVATION OF STALLION SEMEN

1. *To what temperature is stallion semen cooled for shipping?*
2. *What year was the first pregnancy from frozen stallion semen reported?*
3. *What characteristics must sperm maintain in order to fertilize and egg?*
4. *List some advantages of cryopreservation of stallion semen.*
5. *What is the specific name of the container used to ship cooled semen in?*
6. *What is the most common seminal extender to aid survival through the freeze/thaw process?*

AGING HORSES BY TEETH

Subject Matter Outline

Youth should be able to:

- Determine a horse's age by its teeth
- Identify the different types of teeth

I. A horse cuts its baby teeth at these intervals:

- A. 8 days - center incisors (top and bottom)
- B. 8 weeks - intermediates
- C. 8 months - corners

II. Cups go out of baby teeth at these ages:

- A. 1 year - centers (top and bottom)
- B. 1 1/2 years - intermediates
- C. 2 years - corners

III. A horse cuts permanent teeth at these ages:

- A. 2 1/2 years - centers (top and bottom)
- B. 3 1/2 years - intermediates
- C. 4 1/2 years - corners

IV. A 5-year-old horse is said to have a "full mouth" because all permanent teeth are in place.

V. Cups go out of permanent teeth according to the following timetable:

- A. 6 years - lower centers
- B. 7 years - lower intermediate
- C. 8 years - lower corners

- D. 9 years - upper centers
- E. 10 years - upper intermediate
- F. 11 years - upper corners

VI. An 11-year-old horse is said to have a "smooth mouth" because all the cups are now gone.

VII. The galvaynes groove appears on the upper corners when a horse is about 11 and lengthens with age.

VIII. Dental signs of aging

- A. The angle of incidence increases.
- B. The teeth wear down.
- C. The gums recede.
- D. The teeth become more triangular-shaped.

IX. Wolf teeth are located in front of molars, usually in upper jaw.

X. Canine teeth are between incisors and molars, and appear at 4 to 5 years. They are almost always found in males and occasionally in females.

XI. The number of teeth changes as a horse ages.

- A. A young horse has 24 temporary teeth.
- B. A mature mare has 36 to 38 teeth, depending on whether she gets canines.
- C. A mature stallion has 40 to 42 teeth.

1. *A horse has a "full mouth at what age?*

5 years old

2. *The galvaynes groove appears at what age?*

11 years old

3. *List four dental signs of aging.*

Angle of incidence increases
Gums recede

Teeth wear down
Teeth become more triangular in shape

4. *How many temporary teeth does a young horse have?*

24

5. *A mature mare with canines has how many teeth?*

38

6. *When do the temporary center incisors generally appear on a foal?*

8 days

7. *At what age do the permanent center incisors erupt?*

2 1/2 years

1. *A horse has a "full mouth at what age?*

2. *The galvaynes groove appears at what age?*

3. *List four dental signs of aging.*

4. *How many temporary teeth does a young horse have?*

5. *A mature mare with canines has how many teeth?*

6. *When do the temporary center incisors generally appear on a foal?*

7. *At what age do the permanent center incisors erupt?*

MINIMIZING EQUINE INTERNAL PARASITE PROBLEMS

Subject Matter Outline

Youth should be able to:

- Identify major internal parasites
- Discuss parasite prevention methods
- Recognize basic treatment options

I. Introduction

- A. The intensive management of horses, dictated by increasing numbers of animals on smaller sections of land, has dramatized the significance of equine parasites.
- B. The horse and its environment must be managed to minimize problems associated with internal parasites.
- C. The three major species of parasites are strongyles, ascarids and bots.

II. Prevention

- A. A horse owner's primary concern for parasite ingestion is the portion of the life cycle of an internal parasite called the free-living form.
 1. The free-living form lives outside the host and includes the time from passage in the feces to the point that the larva or egg is infective.
 2. The infective stage is the last life cycle before ingestion.
- B. The primary goal of preventive management is to minimize reinfestation.

III. Strongyles

- A. Both large and small strongyles must complete a similar cycle outside the host; eggs are passed in the feces and hatch to larvae in 1 to 3 weeks.
 1. The warmer the environment, the shorter the time to hatching.
 2. The third larval stage is able to travel up blades of grass after being stimulated by moisture and warmth.
 3. Larvae are most active in early morning and late evening.
- B. Nine management practices can help you prevent exposure to strongyles.

1. Rotate the horses among pastures every 2 months.
2. Aerate the soil.
3. Rotate cattle on horse pastures.
4. Avoid overstocking.
5. Prevent food from being contaminated by feces.
6. Pick up manure in stalls at least twice weekly.
7. Compost manure.
8. Avoid hand grazing horses around stables or barns.
9. Quarantine all new additions to the farm, and treat them with proper anthelmintics (antiparasitic drugs) before allowing them to intermingle with the other horses.

IV. Ascarids

- A. Ascarid eggs are sticky and extremely resistant to the elements, making them difficult to avoid.
- B. Steam clean housing and feed equipment, because most disinfectants are ineffective.
- C. Adult horses develop an immunity against migratory forms of the ascarid.
- D. Mature ascarids rarely occur in horses over 2 to 3 years old.

V. Bots

- A. To reduce the number of larvae entering the stomach, apply moist, warm sponges to the eggs or trim the egg-bearing hair.
- B. Include bot medication in the horses' regular deworming schedule from 2 to 4 weeks after the bot fly first appears in late spring through 4 to 8 weeks after the first killing frost.

VI. Treatment

- A. Anthelmintics reduce the worm burdens to a tolerable level.
- B. Modern anthelmintics are not considered useful or effective unless they reduce a specific worm load by 90 percent or more.

1. *What are the recommended practices for preventing exposure to strongyles?*

- Rotate the horses among pastures every 2 weeks.
- Aerate the soil.
- Rotate cattle on horse pastures.
- Avoid overstocking.
- Prevent fecal contamination of food.
- Pick up manure in stall at least twice weekly.
- Compost manure.
- Avoid hand grazing horses around stables or barns.
- Quarantine all new additions to the farm.

2. *List three major species of parasites of horses.*

- Strongyles
- Bots
- Ascarids

3. *What time of day are strongyle larvae most active?*

Early morning and late evening

4. *What percentage of the worm load must be reduced for modern anthelmintics to be considered useful?*

90 percent

5. *To which parasite do adult horses develop an immunity?*

Ascarids

6. *What effect does higher environmental temperature have on strongyles?*

It shortens the hatching time.

7. *When should horses be treated for bots?*

2 to 4 weeks after the bot fly first appears in late spring through 4 to 8 weeks after the first killing frost

MINIMIZING EQUINE INTERNAL PARASITE PROBLEMS

Work Sheet

1. *What are the recommended practices for preventing exposure to strongyles?*
2. *List three major species of parasites of horses.*
3. *What time of day are strongyle larvae most active?*
4. *What percentage of the worm load must be reduced for modern anthelmintics to be considered useful?*
5. *To which parasite do adult horses develop an immunity?*
6. *What effect does higher environmental temperature have on strongyles?*
7. *When should horses be treated for bots?*

BUYING AND SELLING HORSES AT PUBLIC AUCTION

Subject Matter Outline

Youth should be able to:

- Understand the different types of sales
- Know some of the ins and outs of buying and selling

I. Types of sales

- A. Consignment, the most popular type of sale, involves different owners having a person sell several horses of varying sex, age, breeding and training.
- B. Production sales are designed to market the produce of a particular farm or ranch; the horses may be of very high quality.
- C. Dispersal sales involve all the horses owned by the breeder being sold.

II. Buying

- A. When buying a horse, first know what you want.
- B. Have a fair idea of the market value of the horse you want.
- C. Inspect the horse closely; if you see nothing amiss, you are ready to try to buy.
- D. Ask the owner how much he or she wants and then bid on the horse; if you are in range, the owner may sell the horse before the auction.
- E. If the horse must go through the auction, be sure not to miss it; remember that many bargains are struck late at night.

III. Selling

- A. To sell your horse at a public auction, you must first get it fit.
- B. Good horses bring lower prices if they are not fit.
- C. Take a good photograph of your horse for the catalog.
- D. Research your horse's pedigree and write good footnotes.
- E. Include a good produce record of breeding stock and past records of performance horses.

IV. Sale conditions

- A. Whether buying or selling, read and understand the sale conditions.
 1. How many horses will be accepted?
 2. Is enough time scheduled to sell this number of horses?
 3. What are the fees?
 4. How will the sale orders be drawn?
 5. Will the sale be advertised well?
 6. Is a good crowd expected at the sale?
- B. The breeding animals should be guaranteed as breeders, and the riding horses should be guaranteed as sound.
- C. Sale conditions also should state that the horses are offered for sale according to the laws of Texas.

1. *Name three types of horse sales.*

Consignment
Dispersal

Production

2. *Is it possible to buy a horse before the auction?*

Yes.

3. *What are some of the guarantees that should be offered at a public auction?*

Breeding stock are guaranteed breeders.
Performance horses are guaranteed sound.

BUYING AND SELLING A HORSE AT PUBLIC AUCTION

Work Sheet

1. *Name three types of horse sales.*

2. *Is it possible to buy a horse before the auction?*

3. *What are some of the guarantees that should be offered at a public auction?*

A PROFESSIONAL APPROACH TO MARKETING HORSES

Subject Matter Outline

Youth should be able to:

- Discuss the major factors affecting a horse's value

I. Introduction

- Breeders trying to make a profit agree that marketing is the single most frustrating link in the production chain.
- To do a good job in marketing, you must integrate into your program all six factors that affect the price of a horse: pedigree, appearance, age and sex, advertising, method of sale, and method of doing business.

II. Pedigree

- Most horse owners need to be market breeders; that is, they should breed what is fashionable at the time and what is in demand.
- Rank stallion choices according to those with sire records; those with good performance records but no sire records; and those with good pedigrees but no performance or sire record.

III. Appearance

- Don't overlook conformation; pedigree alone won't ensure a good product.
- Sales are enhanced if the horses are well-broken and trained.

IV. Age and sex

- Most breeders should gear their programs to sell yearlings, which are close enough to maturity to promise a great deal, show potential and excite buyers.
- Except for a few stallions, mares sell the best. Geld the poor-quality males as soon as possible.

V. Advertising

- Analyze where your potential customers are and determine how to reach them.
- Be active in the horse business and talk to people about your horses.

VI. Method of sale

- The highest prices are nearly always achieved at private treaty.
- Commission agents can help increase private sales.
- Be a good businessperson and willingly pay commissions to agents who help sell your horses.

VII. Method of doing business

- Modern marketing programs are influenced greatly by the method of doing business.
- Seek professional help on items such as taxes, syndications, cooperatives, partnerships and other ways of doing business.

1. *What are the six factors you must do a good job of marketing to get the best price for your horse?*

Pedigree
Appearance
Age and sex
Advertising
Method of sale
Method of doing business

2. *What is a market breeder?*

Someone who breeds what is fashionable at the time and what is in demand

3. *Why should breeders gear their program to sell yearlings?*

They show potential and excite buyers, because they are close enough to maturity.

4. *True or False: The highest prices are never achieved at private treaty.*

False

A PROFESSIONAL APPROACH TO MARKETING HORSES

Work Sheet

1. *What are the six factors you must do a good job of marketing to get the best price for your horse?*

2. *What is a market breeder?*

3. *Why should breeders gear their program to sell yearlings?*

4. *True or False: The highest prices are never achieved at private treaty.*

WHAT TO DO IF YOUR HORSE IS LOST OR STOLEN

Subject Matter Outline

Youth should be able to:

- Identify the steps to be taken if a horse is stolen

I. Introduction

- A. The actions taken in the first 24 hours after a horse is stolen can mean the difference between recovery and loss.
- B. Long-time persistence can also pay off, as horses have been reunited with their owners even years after the theft.

II. Establishing ownership and illustrating identifying marks

- A. Papers such as receipt of purchase, bill of sale or canceled check can help establish that you own the horse.
- B. Breed registration papers illustrating brands, marks and scars help identify the horse, as do brand and other identification certificates.
- C. A health certificate, Coggins test and veterinarian receipts also may be helpful.
- D. Take at least four good color photos of the horse showing its brands, markings and scars.
 - 1. Photos should include both sides, as well as front and rear views.
 - 2. Photos should be updated yearly to include the horse's summer and winter appearance.

III. Reporting the theft

- A. Several agencies should be immediately contacted upon discovering that a horse is missing.
- B. Insist upon filing a report with the city police department; include a full description of the horse's brands, markings, scars and other identifying characteristics.
- C. County livestock patrols organized by the sheriff's department also recover straying animals.
- D. Texas legislation has given investigation and inspection authority to the Texas Livestock Inspection Program;

its brand inspectors are the most likely people to spot a missing horse if it has been reported missing and properly identified.

- E. Report the theft also to breed associations.
- F. Consider visiting the nearest equine slaughterhouse if it is possible; otherwise call and alert the plant manager or foreman.
- G. Try to attend all livestock auctions and horse sales held in your area.
 - 1. Look in all trailers and pens at the auction.
 - 2. Check parking lot sales.
- H. Contact race tracks, rodeos and other horse events.
- I. Equine veterinarians should be alerted.
- J. Inform equine farriers of the theft.
- K. Tell all your surrounding neighbors.

IV. Publicity and follow-up

- A. Enlist the media.
 - 1. Ask radio and television stations to air a public service announcement with theft and reward information.
 - 2. Use newspapers to raise awareness of area horse thefts.
- B. Follow up daily and stay in regular contact with auctions, law enforcement authorities, equine slaughterhouses and rendering plants.

V. Other tips

- A. Make sure all horses are permanently identified.
- B. Consider installing a security system if none exists on your property.
- C. If you locate your horse, keep it under surveillance, but stay away and never trespass. Let local law authorities handle the recovery.

1. *List five types of records or documents a horse owner should have to help identify a horse.*

- Receipt of purchase, bill of sale or canceled check
- Breed registration papers
- Brand and other identification certificates
- Health certificate, Coggins test or veterinarian receipts
- Four good, color photos.

2. *List at least five people or organizations to contact when a horse is discovered missing.*

- City police
- Sheriff's department
- Texas livestock inspection program
- Breed associations
- Equine slaughterhouses
- Livestock auctions or horse sales
- Race tracks, rodeos or other horse events
- Equine veterinarians
- Equine farriers
- All surrounding neighbors

3. *Name three people or organizations that a horse theft victim should stay in regular contact with.*

- Law enforcement authorities
- Equine slaughterhouses and rendering plants
- Auctions

WHAT TO DO IF YOUR HORSE IS LOST OR STOLEN

Work Sheet

- 1. List five types of records or documents a horse owner should have to help identify a horse.*

- 2. List at least five people or organizations to contact when a horse is discovered missing.*

- 3. Name three people or organizations that a horse theft victim should stay in regular contact with.*

FREEZE BRANDING

Subject Matter Outline

Youth should be able to:

- Describe the procedure involved in freeze branding

I. Introduction

- The use of specific identification (ID) systems for horses is valuable for several reasons.
- Differentiation may be difficult in large management practices.
- Marked horses are less likely to be stolen.
- A specific ID discourages fraudulent practices.
- Several ID methods are available, including tattooing, hot branding, blood typing, color marking systems and freeze branding.

II. Skin anatomy

- A growth follicle and a color follicle combine to give the hair shaft its color.
- When a cold iron is placed on the skin, the temperature destroys the color follicle at the brand site.
- If the iron is held on longer, the temperature destroys the growth follicle as well, so no hair grows at all. On a light-colored horse, this bald brand is more desirable because the dark skin with no hair shows up better than a white brand.

III. Equipment and personnel

- At least three people are needed to freeze brand: a holder, a timer and a brander.
- Equipment needed includes a twitch, a container for the irons, liquid nitrogen, freeze branding irons, gloves, clip-

pers, squirt bottle with 99 percent alcohol, a stopwatch and fly spray.

IV. Branding systems and sites

- Be sure to check with our county clerk, county Extension agent or state brand inspection agency about branding and brand ownership regulations.
- Horses are usually branded on the left or right jaw, shoulder, thigh or butt.

V. Procedure

- Chill the irons to minus 300 degrees F in liquid nitrogen.
- Clean the brand site of foreign material.
- Make sure the horse is still.
- Position the timer.
- Squirt room-temperature alcohol over the brand site.
- Align the iron properly and firmly press it squarely on the brand site.
- Replace the iron in the liquid nitrogen after branding.

VI. Post branding results

- Within seconds, the indented pattern will appear.
- A swelled pattern will appear after 5 to 10 minutes; after a week, the swelling will disappear.
- After a month, the top layer will shed, then white growth will begin.

1. *What is the minimum number of people needed to properly freeze brand a horse?*

Three

2. *List the equipment needed for freeze branding.*

Twitch, container for the irons, liquid nitrogen, freeze branding irons, gloves, clippers, squirt bottle with 99 percent alcohol, a stopwatch and fly spray

3. *How long after the initial freeze branding procedure does it take for a swelled pattern to appear?*

5 to 10 minutes

4. *Which color of horse should have the freeze branding iron left on longer to get a desirable brand?*

Light colored, so the hair growth follicles are destroyed

1. *What is the minimum number of people needed to properly freeze brand a horse?*
2. *List the equipment needed for freeze branding.*
3. *How long after the initial freeze branding procedure does it take for a swelled pattern to appear?*
4. *Which color of horse should have the freeze branding iron left on longer to get a desirable brand?*

HORSE THEFT IN TEXAS

Subject Matter Outline

Youth should be able to:

- Name methods for horse identification
- Identify ways to protect against horse theft

I. Introduction

- A. The two best ways for horse owners to minimize the chances of loss and to maximize economic recovery are having the proper horse identification and securing equine insurance.
- B. Tracking stolen horses can be difficult because of the frequency and locations whereby horses change hands.
- C. In 1990, 315,200 horses were slaughtered in the United States for export purposes.

II. The first step

- A. The first measure to break the lucrative business of horse theft is to enforce the accountability of buyers and transporters of slaughter horses.
- B. The "killer buyers" must obtain a permit from a brand inspector and have all purchased animals inspected before leaving the auction, because theft is essentially impossible to prove unless identification is absolute.

III. Protecting against theft

- A. First industry awareness is needed with publications stressing permanent ID.
- B. Maintain a personal file on horses.
- C. Brand inspectors should be empowered to check all horses intended for slaughter.
- D. All transport vehicles should be required to provide select information.

- E. Law enforcement officers should be empowered to require transport vehicles to provide information where illegal activity is suspected.
- F. Review the current penalties for felony theft of horses.

IV. Identification methods

- A. Hot branding, the oldest method, is used mostly on ranch horses.
- B. Freeze branding is used primarily for ID; The Texas Animal Health Commission uses it to brand EIA (Equine Infectious Anemia) horses.
- C. Acid branding is not used very much on horses.
- D. Hoof branding is not used very much on horses.
- E. Tattoos placed on the upper lip are used by the Jockey Club, American Quarter Horse Association and American Paint Horse Association.
- F. Blood typing is required by the Jockey Club and the Arabian Horse Registry.
- G. Natural physical marks also can help identify a horse.
 1. Signalment is the horse's natural color and markings.
 2. Chestnuts are unique to each horse from birth to death, like a fingerprint.
 3. Trichoglyphs, the whorls and or cowlicks on every horse, are unique in pattern and size; the Jockey Club and APHA require that they be included on registration papers.
- H. Electronic implants provide permanent, unalterable proof of identification.

1. *Name the horse identification methods.*

Hot branding

Acid branding

Tattoos

Electronic implants

Freeze branding

Hoof branding

Blood typing

Natural marks (signalment, chestnuts, tricholgyphs),

2. *What is the first step in breaking the lucrative business of horse theft?*

Enforce the accountability of buyers and transporters of slaughter horses

3. *Name the two best ways for horse owners to minimize the chances of loss and maximize economic recovery.*

Proper horse identification and securing equine insurance

1. *Name the horse identification methods.*

2. *What is the first step in breaking the lucrative business of horse theft?*

3. *Name the two best ways for horse owners to minimize the chances of loss and maximize economic recovery.*

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS (TEKS)

Instructors who use this curriculum will address the following TEKS as outlined by the Texas Education Agency.

Agricultural Science and Technology Education

Introduction to world agricultural science and technology:	To be prepared for careers in the broad field of agriculture/agribusiness, students should attain academic skills and knowledge so that they acquire knowledge and skills related to agriculture/agribusiness.
Plant and animal production:	The student knows the importance of animals and their influence on society.
Agribusiness management and marketing:	The student defines and examines agribusiness management and marketing and its importance to the local and international economy; the student defines the importance of records and budgeting in agribusiness.
Personal skill development in agriculture:	The student demonstrates personal skills development related to effective leadership; the student communicates effectively with groups and individuals; the student demonstrates the factors of group and individual efficiency.
Animal science:	The student explains animal anatomy and physiology related to nutrition, reproduction, health, and management of domesticated animals; the student determines nutritional requirements of ruminant and nonruminant animals; the student explains animal genetics and reproduction; the student recognizes livestock management techniques.
Advanced animal science:	The student demonstrates principles relating to the interrelated human, scientific, and technological dimensions of scientific animal agriculture and the resources necessary for producing domesticated animals; the student examines animal anatomy and physiology in livestock species.
Equine science:	The student analyzes equine science as it relates to the selection of horses; the student knows the nutritional requirements of horses; the student analyzes equine science as it relates to the management of horses.

DEVELOPMENTAL ASSETS AND LIFE SKILLS

Participants who learn from this curriculum may develop certain assets and life skills that contribute to their personal development.

Developmental Asset Search Institute	Targeting Life Skills Model Iowa State University Extension
Positive values #30 Responsibilities Social competencies #32 Planning and decision making #33 Interpersonal competence Positive Identity #37 Personal power #38 Self-esteem #39 Sense of purpose #40 Positive view of personal future	Self-responsibility Decision making Resiliency Managing feelings Self-esteem Goal setting



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