

FROM CONCEPTION TO TWO YEARS OLD, PART II

Nutrition of the Growing Hanoverian

“We are still seeing too many foals with growing issues that either stem from too much food and/or the improper balance of vitamins and minerals. Added care must be given to see that they receive proper nutrition before birth, and during those crucial formative early months.” – Dr. Ludwig Christmann

All of us who breed warmbloods are interested in reducing the number of skeletal problems associated with growth, improving reproduction and optimizing performance up to our horses' genetic potential. We ask ourselves, “How can we effectively manage this on our farms today, without causing digestive upset (colic), while maintaining optimal health and well being in all of our horses?” Understanding nutrition's role in all of this and dispelling old “myths” is a great place to start.

[BY DONALD R. KAPPER, PAS]

Part II:

HORSE OWNERS AND TRAINERS MUST realize that forage (hay and/or pasture) is the mainstay of all horse diets and that grain mixtures or diet balancers are only fed to make up the difference between the nutrients found your forage and the nutrients needed to grow, reproduce or perform up to their genetic potential. They must also realize that, the more mature the forage, the lower the nutrients become **and** the less “available” they are to the horse also.

All horses have the ability to “store” essential nutrients in different parts of their body. For example, calories fed in excess will be deposited as fat on the body. Protein will be stored in the muscle, but will not continue to build up excess amounts similar to fat storage. If amino acids (protein) are deficient or unbalanced, horses have the ability to

pull them from their body reserves to help maintain normal body function. Calories (body fat) and protein (muscle) are two nutrients you can visibly monitor and physically palpate. If calories are in short supply, their body fat will be used up and they will lose body condition (weight). If calories are in excess, they will become heavier. If amino acids (protein) are in short supply, muscle mass will be sacrificed. This will first be seen on their topline and then their hindquarters will be compromised, too. If adequate amino acids are fed, muscle size will be dependent on their genetic potential.

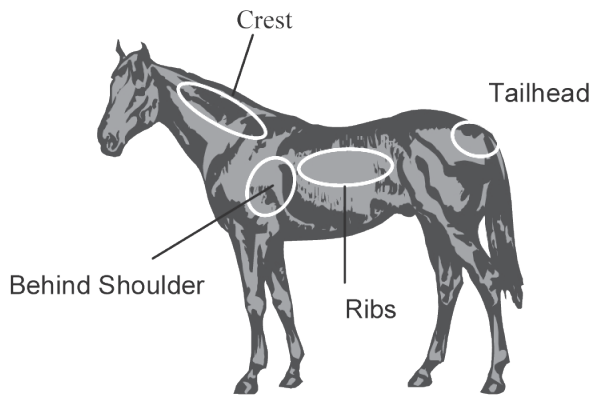
Body Condition Scoring and Muscle Development Scoring of Horses

Knowing the “ideal” body weight of your horse is necessary to determine how many calories you need to feed per day. Body condition scoring is a “visual and hands on” method to evaluate the amount of body fat a horse is carrying. Developed at Texas A & M University by D. R. Henneke and others, this system is a good management tool to determine the optimum amount of body fat for every type and age of horse and will help you decide if the horse is being fed enough calories to maintain its desired body weight. ▶



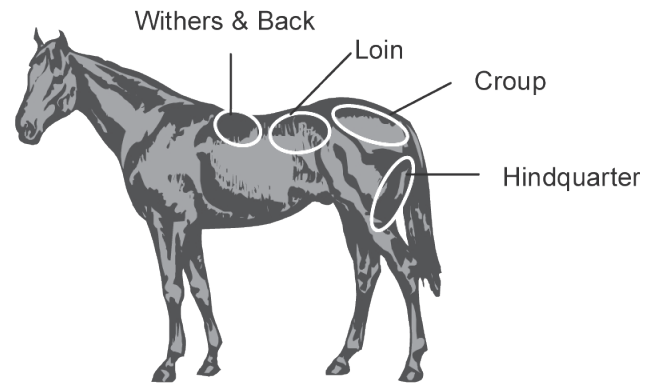
SHARI GLICKMAN PHOTO

Selecting the correct grain mixture or diet balancer is necessary to make up the difference between what is in your forage and what your horse needs to attain optimal health and growth to perform to its genetic potential like the Hanoverian mare Allegra Q (Anhaltiner E-EM Fifth Avenue Q/Wertherson), owned and bred by Suzanne Quarles, Md. Allegra's impressive score of 7.75 tied for tenth place among the top inspection mares of 2006.



Horse "A" – Body Condition Score

Fat Thickness (from calories)



Horse "B" – Muscle Development Score

Muscle (from amino acids & genetics)

In reviewing the diagram for Horse "A" (above), the thickness of the fat covering areas of the crest, withers, over the ribs, behind the shoulder, then around the tail head is evaluated. All of these areas must be evaluated and scored independently, because different genetics and body types store fat in different locations. That is why all four of these areas must be averaged together to get a true Body Condition Score.

Body condition scores range from 1 to 9, with a score of 1 being emaciated with no fat stores and 9 being extremely obese. A score of 5 indicates a moderate condition and the ideal body weight for most horses. Be sure not to confuse body fat stores with gut fill or "hay belly". Two of the causes of distended belly in horses are: 1) eating non-digestible fiber, and/or 2) lack of physical fitness. Neither of these is related to the calories consumed or fed per day.

In reviewing the diagram for Horse "B", do not confuse body fat stores with adequate or inadequate muscle development as poor muscling can be caused from a protein deficiency (unbalanced amino acids). When a horse is fed an unbalanced or inadequate amino acid diet, they have the ability to tear down their muscles, where these nutrients are stored, to keep the body functioning. The first visible loss in muscle mass is in the withers area, followed by the back, loin, croup, and then their hindquarters. In other words, the topline is the first place to look for protein deficiency. In order to round out the back area with fat deposits, the horse will have to have a BCS of over 7. When evaluating each horse for Muscle Development vs. Fat Thickness, remember, muscle does not "jiggle" when they walk or trot!

Both of the following charts indicate optimal, caution, and potential health problem ranges. These problems can devel-

op if the horse becomes too heavy or too thin and performance will be compromised if they have inadequate muscle development.

Description of Body Scores 1-9

	Score	Name	Description
Pot. Health Problems	1	Poor	Animal extremely emaciated. Spinous processes ribs, tail head, hooks and pins projecting prominently. Bone structure of withers, shoulders and neck easily noticeable. No fatty tissues can be felt.
	2	Very Thin	Animal emaciated. Slight fat covering over base of spinous Processes; transverse processes of lumbar vertebrae feel rounded. Spinous processes, ribs, tail head and hooks and pins still prominent. Withers, shoulders and neck structures faintly discernible.
Caution	3	Thin	Fat buildup about halfway on the spinous processes; transverse processes cannot be felt. Slight fat cover over ribs. Spinous processes and ribs easily discernible. Tail head prominent, but individual vertebrae cannot be easily identified. Hook bones appear rounded, but easily discernible. Withers, shoulders and neck accentuated.
	4	Moderately Thin	Spinal processes still visible and can be palpated. Can see outline of ribs. Tail head prominence depends on conformation also. Pin bones not discernible. Withers, shoulders and neck not obviously thin.
Optimal	5	Moderate	Ribs cannot be visually distinguished when standing, but can be easily felt. Fat around tail head beginning to feel spongy. Shoulders and neck blend smoothly into body.
Caution	6	Moderately Fleshy	Fat over ribs feels fleshy-spongy. Fat around tail head is visible and feels soft. Fat beginning to be deposited behind the shoulder and along the neck.
	7	Fleshy	May have a fat crease down back, making it difficult to determine a true back and loin Muscle Development Score. Individual ribs can be felt, but noticeable filling between ribs with fat. Fat around tail head is soft. Fat continues to be deposited behind shoulders and along the neck.
Pot. Health Problems	8	Fat	Fat crease along topline; withers, down back and loin area filled with fat, making it even more difficult to determine a back and loin. Muscle Development Score. Difficult to feel ribs. Fat around tail head very soft. Area behind shoulder filled with fat. Noticeable thickening of neck. Fat deposited along inner thighs.
	9	Extremely Fat	Obvious crease down back making it extremely difficult to determine Muscle Development Score. Patchy fat appearing over ribs. Bulging Fat, i.e. fat around tail head, along withers, behind shoulders and along neck. Fat along inner thighs may rub. Flank filled with fat.

Progressive Nutrition has developed a Muscle Development Scoring system to complement the current Body Condition Scoring system. This is based on the amount of muscle-building nutrients a horse has eaten per day vs. needed per day, to attain their optimal muscle development. The extent of muscle size will be directly related to their individual genetics, i.e. muscle type. Too many horses today are showing signs of inadequate muscling and it is negatively affecting their ability to grow, reproduce and perform up to their potential. This shortcoming is first seen as an under developed topline or “concave” appearance on each side of the vertebra in their back, loin and croup areas. The topline is determined by the amount of and balance of amino acids in their diet, plus their genetic make-up of “muscle type”, i.e. fast twitch vs. Slow twitch. Genetics determine if they have “bulky” muscles or “long and lean” muscles. When these muscles are “nutritionally” built-up to their “genetic” potential, the trainer can then “condition and define” them.

The Muscle Development Scoring (MDS) system (*right*) will assess your horse’s muscle status, and with the BCS, will give your horse two independent scores. The first score (1 through 9) will be their body fat thickness and the second score (A through E) will be their muscle development. A “BCS of 5”, with a “MDS of A”, is ideal for optimal growth, health and performance in all horses.

The Form of Calories and Protein Quality Fed Will Affect Growth and Performance

An optimal feeding program will consider **all** the nutrients from the forage first and then add only those nutrients needed in the form of a grain mixture or diet balancer. Nutrients can be categorized as water, protein, fat, carbohydrate, minerals and vitamins. Successful diet recommendations should provide you with the “optimal range” of all these nutrients, including fiber, which are necessary to maintain the health of your horse.

Calorie Sources

There are many different forms of calories that we can choose from today, including carbohydrates, starches, fats/oils and fermentable fiber.

Cereal grains: oat, corn, barley, rice, wheat, etc., are the most economical sources, but

Description of Muscle Development Scores A-E

	Score	Name	Description
Optimal	A	Good Back	Evaluate the Back area from the side and from the rear of the horse looking down over this area. Assess the muscle development on both sides of the spinal column in the back and withers area. This is the first area that muscle is lost when amino acids are not balanced or are in short supply, and the last area the horse develops or rebuilds when adequate amino acids are provided. The back should not be concave, but should blend smoothly into the ribs from each side of the vertebra. An ideal back area is assigned a grade of A; if not, a lower grade is given.
	B	Concave Back but Good Loin	Evaluate the Loin area from the side and from the rear of the horse looking down over this area. The loin should be visually level, round and blend smoothly into the ribs. Additional hands-on evaluation is recommended to help define this area. The height of the muscles on each side of the spinal processes should be equal to, or higher than they are, preventing you from seeing or palpating their vertebra with the flat palm of your hand. An acceptable loin is assigned a grade of B; if not, a lower grade is given.
Caution	C	Concave Loin but Good Croup	Evaluate the Croup area from the side and from the rear of the horse. The muscles in this area should be level to or higher in between the center of the vertebra and the point of the hip, with no indentation or concave appearance, as it ties in with the hindquarter. An acceptable croup is assigned a grade of C; if not, a lower grade is given.
	D	Concave Croup but Good Stifles	Evaluate the Hindquarters with a view from the rear of the horse. The primary area for evaluation is the development and width of the stifle. This area must be equal to or wider than the points of the hip in all breeds of horses. The muscle crease down the back leg will be dependent on their individual muscle type, i.e. fast twitch (thick) or slow twitch (long and lean). An acceptable hindquarter is assigned a grade of D; if not, a lower grade is given.
Potential Health Problems	E	Narrow Stifles	Narrow Stifles When the width of the stifle is narrower than the width of the points of hip, a grade of E is given.

“TIME TO IMPROVE EACH AREA” RULE OF THUMB: *The horse will build or develop muscle in the reverse order in which it was lost, hindquarter, croup, loin and the last will be the back and withers area. It will take an average of 30 days to improve one grade after the diet is balanced.*

all factors need to be considered. Starches found in cereal grains are not all created equal in either: 1) the horse’s ability to break them down for digestion and utilize them, or 2) in calories per pound. They are broken down by enzymes so they can be absorbed in the small intestine. However, due to the difference in digestion time, plus the fast rate of passage through the small intestine, there is a maximum amount of starch that should be fed at one time. We recommend a **maximum** of five pounds of cereal grain be fed per feeding per 1,000 lb. of body weight. If more is fed, the excess starch may pass into the cecum (fermentation vat) and cause digestive problems. Lactic

acid is a by-product of starch and it can lower the pH of the horse’s fermentation vat (hind gut) resulting in Acid Gut Syndrome (AGS). This results in compromising their microbial population, which can affect their health and absorption of all other nutrients.

The results can be visibly seen as:

- 1) Loss in body condition (weight)
- 2) Loss in muscle mass (poor topline)
- 3) Electrolyte imbalance (tying-up)
- 4) Poor performance (early fatigue)
- 5) Attitude change and unwilling to stay focused while training
- 6) Loose stools with a very “acid” aroma ▶

To help you identify AGS in a horse, you can purchase a soil pH meter from your garden store, (about \$20.00) and test a sample of “fresh” feces. Normal pH should be between 6.7 and 6.8. A figure less than this is an indication of Acid Gut Syndrome caused from feeding too many carbohydrates/starches and/or inadequate digestible fiber.

Vegetable Oils: Vegetable Oils have been very successfully fed to horses because they provide almost two-and-a-half times as many calories per pound as cereal grains, without the starch. When adding oils into the diet, the amount of cereal grains can be reduced and still meet the horse’s calorie needs. Feeding less cereal grain will lower the amount of nonstructural carbohydrates fed, which will lower the chance of Acid Gut Syndrome.

Vegetable Oils are digested more efficiently than cereal grains, but if a little is good, a lot is definitely not better! Horses have no gall bladder – they have a “continuous flow” of bile from the liver into the beginning of the small intestine. If more oil is fed then can be “emulsified” by the current flow of bile, it will not be broken down and will escape absorption in the small intestine, upsetting the fermentation process in the cecum. When oil is overfed, it can interfere with calcium absorption and fiber fermentation, causing the horse to either stop eating or develop loose stools.

Fat/oil is in everything the horse eats naturally. Forages will average between five percent fat/oil in immature pasture grasses, to one percent fat/oil in over-mature grass hay. Cereal grains will average between three to four percent fat/oil. The horse can easily consume and digest up to seven percent fat/oil in the total diet, so the best “Rule of Thumb” to use is to not feed over 1.5 lbs of fat/oil per day per 1,000 lbs of body weight.

The benefits of adding fats/oils into the performance horses’ diet have been:

- 1) an increase in stamina
- 2) a more consistent attitude
- 3) reduction in tying-up and
- 4) less heat produced during digestion, which can be beneficial in hot weather.

Don’t overlook the fact that “good” quality, immature forages (hay and pasture with a Relative Feed Value above 103) can and will provide a significant amount of calories to young growing horses, nursing mares and horses in training.



Horses evolved as continuous grazers of forage, consuming large quantities of “fresh” grass pasture every day. Fat/oil is in everything the horse eats naturally. Forages will average between five percent fat/oil in immature pasture grasses, to one percent fat/oil in over-mature grass hay. Shown above is the 2007 filly Fleurette (Fabuleux-Fun Choice xx/Don’s Choice xx) owned and bred by Kris Schuler, Pa.

Protein Sources

There are many different protein grains that we can choose from today. The highest quality protein grain contains the best balance of amino acids for the horse. Today, lysine is the first limiting amino acid in a grass forage diet. Amino acids are the “building blocks” of protein and are only as good as the “first limiting” amino acid in your horse’s forage, grain mixture and/or diet balancer. Extruded Soybean and Soybean Meal are two quality protein sources for horses. If your forage needs protein added to it to meet your horse’s needs, either soybean or individual amino acids can be added into their diet.

Pay attention to the protein sources in your grain mixture and not just the crude protein percentage on the feed tag. There are other less expensive protein grains that contain a high crude protein with inadequate and/or unbalanced amino acids. The quality of protein is more important to the horse than other animals that eat forage because their primary absorption site of amino acids is in the small intestine, before their fermentation vat. This is in direct contrast to ruminant (cud-chewing) animals such as cattle, sheep, goats, etc., where the fermentation vat is first and then, after the food is broken down by the micro-flora, passes into the small intestine for absorption.

Balanced amino acids are needed to:

- 1) Develop and maintain lean muscle mass
- 2) Improve skeletal development (growth, tissue repair and turnover)
- 3) Improve hair and hoof quality, etc.

ProAdvantage Grass formula pellet is a diet balancer, manufactured by Progressive Nutrition, which contains a very concentrated source of high quality amino acids, major and trace minerals, and vitamins. It contains soybean meal, extruded soybean and dried distillers grains with added amino acids, and no cereal grains in its formulation. Therefore, it is very low in nonstructural carbohydrates and calories per pound, which makes it the ideal feed for the “easy-keeping” Warmblood. Only a few pounds/day will complement grass and mixed forage (hay) and meet the horse’s entire nutrient needs. (See Part I in *The American Hanoverian* – 2007 Spring issue)

Excess protein is not recommended, nor is there any benefit to feeding it. When excess proteins are consumed, they are deaminated in the body and converted into urea and fatty acids. The urea, (ammonia) is removed from the body in the urine and the fatty acids are converted into calories. It takes almost the same amount of energy for this process to occur in the horse as it produces in the horse. Therefore, little if any additional

calorie/energy is made available to the horse. (Another ole' wives tale bites the dust!)

Feeding less protein than recommended will negatively affect:

- 1) the young horse's health and growth rate, including bone density, tendon elasticity, cartilage development and the transformation of cartilage into mature functional bone
- 2) milk production in the nursing mare, quantity and quality
- 3) overall muscle development, beginning with the topline
- 4) hair and hoof quality and growth
- 5) ability to consistently perform at the upper levels in dressage or jumping

The Latest Information on Essential Fatty Acids — Omega 6 vs. Omega 3

Since 1986, several studies have been published showing beneficial effects of improved stamina and endurance in performance horses by adding fat into their diets. But the most recent “buzz” and research focus has been on the addition of specific “Oils”. From a calorie standpoint, vegetable oils are created equal. However, oils contain different amounts of “essential fatty acids”, so they are not created equal from a “nutritional point of view”. When oil is digested, free fatty acids are incorporated into cell membranes. Some fatty acids however cannot be synthesized by the horse or in sufficient quantities to meet its nutritional needs. These are called “essential” fatty acids and must be added into the horse's diet on a daily basis. Two of these essential fatty acids are called Omega 6 and Omega 3.

Horses evolved as continuous grazers of forage, consuming large quantities of “fresh” grass pasture every day. Results of a two-year study conducted by Lori K. Warren, PhD, Assistant Professor of Equine Nutrition, University of Florida, stated, “Oils in fresh grass will depend on its maturity and will vary from three to five percent and this oil will contain 40 to 55 percent Omega-3's”. Today, accepted horse management has replaced much of the fresh pasture diet with dry hay. Dr. Warren continued, “The oil content in hay will depend on its maturity when cut and will vary from one to three percent and it will contain 18 to 35 percent Omega-3's. While cereal grains contain oils varying from three to four percent, 50

Table 1: Different Oil Sources Available Today

The Percentage of Oil in Seeds, Omega 3's in the Oil, and Omega 6:3 Ratios Found in these Oils

Oil Sources	% Oil in the Seed	% Omega 3s in the Oil* (C18:3,C20s)	Omega 6:3 Ratios (rounded to nearest whole number)
+ Flaxseed (Linseed)	36.0%	53.3%	1:4
+ Menhaden (Fish Oil)	100%	31.0%**	1:15
+ Canola (Rapeseed)	28.0%	12.9%	2:1
+ Soybean	18.0%	7.0%	7:1
- Rice Bran	20.0%	0.8%	29:1
- Corn (Maize)	3.6%	0.7%	84:1
- Sunflower	19.0%	0.2%	199:1

+ Recommended

- NOT Recommended

* Fatty Acid composition as listed in NRC's for animals

** Refers to the ingredients TOTAL Omega 3's that contain C20's (EPA & DHA). Other oils do not contain EPA or DHA.

percent of this oil is Omega-6's and it contains very little Omega-3's.”

“There has been considerable work in other animal species and in humans to show that Omega-3 supplementation affects the ratio of Omega 6:3 in blood and in tissues, with alterations in the fatty acid composition of plasma (cell) membranes,” says Ray Geor,

All Omega 6 fatty acids are pro-inflammatory which help maintain the animal's immune system and are beneficial during infection and sickness. However, if too many Omega 6 fatty acids are fed, an imbalance can occur, leading to an altered physiological state and potentially harmful inflammation in traumatized areas, i.e. joints.

BVSc, MVSc, PhD, professor at Virginia Polytechnic and State University. Oils containing higher levels of Omega-3 are found in the natural diet of horses (forage) and can be digested easily with positive affects on the horses system. The Omega 6:3's must be kept in balance when additional oils are added into their diet.

Cereal grains (Oat, Barley, Corn, Wheat, Rice, etc.), as well as the oils from Sunflower, Corn, Rice Bran and Cottonseed, all contain

high percentages of Omega 6 in relationship to their Omega 3 levels. All Omega 6 fatty acids are pro-inflammatory which help maintain the animal's immune system and are beneficial during infection and sickness. However, if too many Omega 6 fatty acids are fed, an imbalance can occur, leading to an altered physiological state and potentially harmful inflammation in traumatized areas, i.e. joints. On the other hand, the Omega 3 fatty acids are potent, anti-inflammatory agents that help reduce pain and swelling and help return the horse's system to normal function.

As with all nutrients, balance is the key. Table 1 shows which oils are best for the horse, in descending order of their Omega 3 levels, from top to bottom. The top four oil sources are the best to increase the Omega 3's and the bottom three sources are the ones we do not recommend adding into your horse's diet, because they could provide too many Omega 6's, without adequate Omega 3's. Fortunately, we are now beginning to recognize the detrimental effects that these imbalances can cause the horse and recommend staying away from these “unbalanced” sources of fatty acids (oils).

Adding vegetable oils that contains higher levels of Omega 3 into horses' diets have proven to be beneficial to those that are not eating fresh grass pasture at least 18 hours/day.

Short-term benefits include:

- 1) improved skin and hair coat
- 2) fewer skin allergies
- 3) anti-inflammation characteristics

Long-term benefits include:

- 1) improved hoof quality
- 2) increased bone density
- 3) improved joint health
- 4) reduced muscle soreness
- 5) Mares' milk containing higher Omega 3 levels resulting in healthier foals by improving their immunity and resistance to infection
- 6) improved stallion fertility by helping maintain cell viability and thereby improving conception rates
- 7) increased tissue elasticity reducing the incidence of EIPH (Exercise-Induced Pulmonary Hemorrhage) in performance horses

Practical Applications of Nutrition Management for All Horses

- 1) Owners and managers must read the feeding directions on the feed bag and never feed less than the manufacturer's recommended amount per day, according to the horse's size. If the suggested amounts per day are unrealistic, select a different feed!
- 2) To ensure that nutrition is not a limiting

factor, make sure to follow the feeding recommendations of the manufacturer according to your horse's age, individual size, reproductive status or performance level.

- 3) Select your added calorie source (cereal grain vs. vegetable oil) and then feed according to the desired Body Condition Score (weight) for each individual horse.
- 4) Select your protein, mineral and vitamin source, then feed according to their needs and Muscle Development Score.

Today's Take Home Message

Balancing your horse's total diet comes from:

- 1) Knowing the nutrient needs of your horse (age, size, reproductive status and performance level)
- 2) Knowing the "type" and "quality" of the forage (hay and pasture) on your farm
- 3) Selecting the correct grain mixture or diet balancer to make up the difference between what is in your forage and what your horse needs to attain optimal health and grow up to perform to its genetic potential. ■

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