



Refeeding the Poorly Conditioned Horse

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Poor body condition in horses can be caused by many factors. Age, disease and lack of adequate nutrition are three of the most common. Usually, nutritional related reasons are due to a lack of carbohydrate, fat or protein intake. However, even with appropriate care and nutrition, elderly horses may not be able to maintain a desired body condition. Similarly, numerous diseases can lead to poor body condition, from a lack of appetite, or the inability of the horse's body to function normally.

A refeeding plan coordinates nutritional and veterinary therapies that combine to improve body condition of a poorly conditioned horse. Successfully refeeding a poorly conditioned horse can be extremely difficult, even with knowledgeable supervision and a detailed, well-referenced plan. One veterinary science study reported that nine of 45 horses that had previously been subjected to prolonged malnutrition died after being placed with a responsible caregiver and provided an appropriate diet¹. Defining a refeeding plan requires in-depth diagnosis of the health status of the horse. Veterinarian intervention, therefore, is necessary prior to and during the refeeding period of poorly conditioned horses. Typically, veterinarians will perform physical examinations that include a detailed dental exam and subsequent diagnostic tests to evaluate concerns noted during physical examinations.

Assessing Body Condition

Body condition relates to the amount of visible fat cover on a horse's body. The most commonly accepted assessment method is a scoring system using a scale of 1 to 9². A thorough explanation of the scoring system is discussed in OSU Extension Fact Sheet F-3920 Body Condition of Horses. Figure 1 defines the locations on a horse's body that have observable differences of fat cover at different body conditions. Horses in the low end of the condition scale have little noticeable fat cover at locations along the neck, behind the withers, along the ribs and on the hip. The individual bony structures of vertebra and the pelvis are noticeable (Photos 1 and 2).

Horses in poor to very thin body conditions (Scores of 1 or 2) have little visible fat and appear to have had appreciable

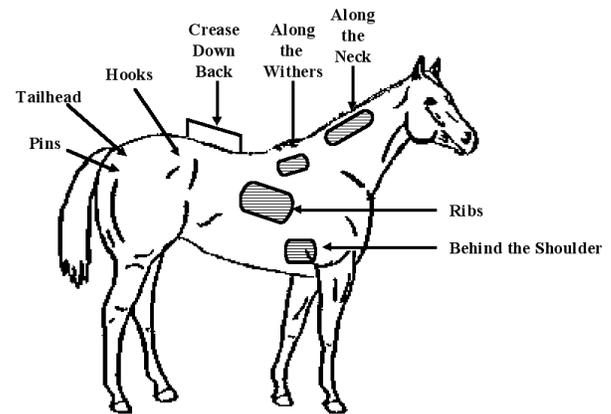


Figure 1. Locations of Fat Cover used in Body Condition Scoring System.

lean tissue degradation. Body fat provides the major energy reservoir. The horse's body systems will mobilize fat for fuel when energy needs are greater than the daily energy intake. As the time period of inadequate nutrition is prolonged, fat stores are depleted and noticeable amounts of muscle are broken down for use as energy.

There is no uniformly agreed upon benchmark as to what constitutes a horse in undesirably low body condition. It is common for some highly trained equine athletes to have thin to moderately thin body conditions and be in the peak of health. Generally, most reports from veterinarians and nutritionists consider horses in body condition scores of one or two as emaciated, malnourished, or under conditioned as a result of being underfed or combating a disease or age condition that restricts weight gain.

Poor body condition is usually associated with insufficient intake of energy or protein. Malabsorption, parasitic infestation, old age, senility, and a number of diseases can also cause emaciation. Thus, to be effective, nutritional therapies for correcting poor body condition must be aligned with the correct diagnosis of the cause and the health status of the horse.

Review of Published Reports on Refeeding Poor Conditioned Horses

Some poor conditioned horses may be so debilitated that they are unable or lack the desire to eat. Horses in this condition will require veterinary intervention. A feeding tube

¹ Whiting, T. L., R. H. Salmon, and G. C. Wruck. 2005. Chronically starved horses: predicting survival, economic, and ethical considerations. *Can. Vet. J.* 46(4): 320-324.

² Henneke, D. R., G. D. Potter, J. L. Kreider, and B. F. Yeates. 1983. Relationship between condition score, physical measurements, and body fat percentage in mares. *Equine Vet. J.* 1983 15(4):371-372.



Picture 1. Horse in a body condition score 1. Note skeletal features evident in areas of normal fat deposition. *Photo courtesy of Dr. Don Henneke, Tarleton State University.*



Picture 2. Horse in body condition score of 2. Note the evidence of individual vertebrae along the back and croup area.

can be placed into a horse's stomach so a liquid diet can be administered if a horse is unable or unwilling to eat. Placing a nasogastric tube into a horse's stomach should be performed by a veterinarian as an improperly placed tube can result in death. An intravenous catheter can supply nutritional support if a horse's digestive tract cannot handle liquid or solid food. This type of nutrition is costly and is only used short term until the digestive tract will accept and utilize feed.

The feeding frequency, dietary nutrient profile, and physical form of the diet will define the refeeding plan. Although limited in both number and scope, there are reports in veterinary and nutritional science journals that provide guidance for refeeding plans. The rations recommended in specific reports likely are influenced by the availability of specific feeds and processing methods at the time and location of the report, regional traditions of what routinely is fed, and personal experience. As such, the specific ingredients mentioned may not be as important as are similarities of nutrient composition and routines among the reports.

In general, it is recommended to provide grain following one or two days after feeding long stem forage. Grains are relatively high in starchy carbohydrates, and there is some concern among veterinarians and nutritionists that horses in poor condition may not utilize these ingredients initially with as much success as high fiber feedstuffs. Recommendations

are to begin refeeding by starting with water, electrolytes, and in most cases, hay, followed with frequent meals of small amounts of grain^{3,4,5}.

One suggested protocol is to begin with offerings of small amounts of hay, i.e. two pounds every two hours³. After several meals, amounts are increased to levels approximating about one half the needs for dietary energy for maintenance by feeding hay in four meals per day for two days. Hay is then offered free choice.

This diet should continue for a couple of weeks, after which additional nutrient sources, i.e. grains, are introduced. Similar to hay, grains should be introduced gradually by initially feeding small amounts at frequent intervals.

One such recommendation is to introduce grain by apportioning into five to six daily feedings of one pound to one and one half pounds each⁴. This level should be tolerated well by most averaged sized stock horses. Even so, recommendations emphasized the need to treat horses individually, and adjust rationing frequency and levels according to the horse's response.

A different report provides another routine for introduction of a grain mix⁵. Horses in extremely poor condition are to be offered hay and water if they are initially unable to walk, along with initial diets prescribed by a veterinarian. Once stabilized, a 12 percent crude protein grain mix with mineral supplement, molasses, and bran is prescribed to be fed three times daily at levels of about one pound per feeding. After one week, the levels are increased to two pounds per feeding for the a.m. and p.m. feedings, with the noon feeding remaining at 1 lb. Once the horse has improved its condition somewhat, the grain mix is to be fed at levels of three to nine pounds per day, depending on the size of the horse. The horse continues to receive free choice levels of hay and unlimited access to grazing. After 30 days of feeding, zero to sixteen pounds of the grain mix is fed daily into two allotments each day. The estimated time period to improve body condition from a very poor condition to a moderate condition is six to 10 months.

A 2004 report from the College of Veterinary Medicine at the University of Minnesota provides a refeeding protocol based on their experiences of treating poor conditioned horses⁶. A systematic protocol is outlined that includes monitoring of weight, physical examinations, parasite treatment, and blood chemistry profiles. The dietary protocol begins with restricted intake of high quality grass hay. Hay is offered by hand at hourly intervals for the first day if horses had no oral intake for the previous twenty-four hours. If the horse had some feed before admission, it was permitted full access to grass hay. A complete feed is gradually introduced beginning on the fourth day at one half pound per meal twice daily for an average size horse. A complete feed is formulated to contain all nutrients needed in the diet of a horse in a processed mix, and does not require the addition of hay for balancing nutrient needs. The amount or frequency of feeding the complete feed is increased gradually every other day to a maximum of three

³ Kronfeld, D. S. 1993. Starvation and malnutrition of horses: recognition and treatment. *J. Equine Vet. Sci.* 13(5):298-303.

⁴ Finnocchio, E. J. 1994. Equine Starvation: Recognition and rehabilitation of the recumbent, malnourished horse. *Large Animal Veterinarian*: March/April, pgs 6-10.

⁵ Poupard, D. B. 1993. Rehabilitation of horses suffering from malnutrition. *J. Equine Vet. Sci.* 13(5):304-305.

⁶ Wilson, J.H. and D.A. Fitzpatrick. 2004. How to manage starved horses and effectively work with humane and law enforcement officials. *50th AAEP Proc.*, p. 428-432.

pounds per feeding as long as the horses are consuming the allotted amount. Trace minerals are added in block or loose form beginning on the fourth day.

Twelve horses receiving this protocol reported weight gain that varied greatly from horses showing little to no gain to some gaining as much as six to seven pounds per day for 11 days. These high levels of gain per day are likely to be reflective of body fill of forage and water in the digestive tract. Rates of gain of actual tissue may be more in the range of one to three pounds of gain per day during the initial refeeding period. Body condition scores averaged a score of two with a range of one to three. Body weights ranged from approximately 400 to 1,100 pounds and ages from five months to over 20 years.

Most reports, as those above, have made recommendations based on clinical experience and review of case studies instead of controlled research studies that accurately quantify the response of undernourished horses to different diets. One trial that has conducted such research has been reported by investigators at the School of Veterinary Medicine at University of California, Davis⁷. Twenty-two poorly conditioned horses were divided into three groups. The previous histories of the horses were unknown. On average, the horses weighed about 700 pounds, between 14 and 15 hands tall, and in a body score of one or two.

The groups differed in the type of diet: alfalfa hay, oat hay, or a third diet made of a combination of oat hay with a commercially available, complete feed containing grain and high fiber components. The horse's physiological response to the initial 10 days of refeeding were observed and compared.

The three different diets were fed at equal levels of energy intake. For the first three days, the horses were fed six times per day at levels estimated to provide 50 percent of their normal digestible energy requirements. This equated daily to six to seven pounds of alfalfa hay, about nine pounds of oat hay, or seven pounds of the oat hay with the complete feed. Amounts were increased to estimated levels of 75 percent of their normal digestible energy requirements for the following two days, and then increased to 100 percent of their estimated digestible energy requirements for the last five days of the investigation. The number of meals fed was reduced from six to four times per day during days six through 10. Total intake on day 10 averaged about 13 pounds of alfalfa, 17 pounds of oat hay, or 13 pounds of the oat hay-complete feed mix.

Weight gains were not different between the three groups of horses, although alfalfa hay was suggested to have several advantages. The oat hay was very bulky and caused diarrhea in several horses, and the oat hay was lower in some essential minerals. The authors cautioned against the initial use of the higher starch-containing ration of the oat hay combined with a complete feed because of evidence suggesting the potential for adverse blood insulin responses. An undesirable insulin response to the initial period of refeeding is one of the noted concerns with researchers studying the effects of reintroducing food following prolonged malnutrition.

The same researchers subsequently compared alfalfa hay with an alfalfa hay combined with corn oil⁸. The addition of corn oil reduced the amount of hay needed to be fed at comparable estimated digestible energy intakes. While the addition of corn oil had no harmful effects, the investigators

still recommended the alfalfa hay without corn oil. More hay was fed without the addition of corn oil, which increased the intake of minerals contained in the hay.

Regardless of diet composition, the researchers emphasized the need for small, frequent allotments of food being offered in the initial refeeding period. They recommended that horses can be fed as much as they will eat of an alfalfa hay diet after 10 days to two weeks. Although some weight gain can be expected after one month of care, they suggested that three to five months will be necessary for the horses to return to normal body weight.

Suggested Feeding Plans for Reconditioning Poor Conditioned Horses

Several recommendations for the initial refeeding of poor conditioned horses can be developed from the suggestions and research discussed above. A physical examination including careful examination of the oral cavity and appropriate diagnostic tests should be performed by a veterinarian so nutritional plans can be aligned with the health status of the horse. It is possible that appetite or ability to eat solid feed may be compromised. In that case, supportive liquid diets may be prescribed by a consulting veterinarian.

Water should be offered and intake documented. The most common course is to feed hay or coarsely processed forage for the first several days. Forage should be of high quality, and alfalfa is recommended as one suitably desired forage type. If hay is not available, alfalfa cubes may be an alternative. Softening cubes by soaking in water may be necessary if the horse's dental condition is poor. Indigestible, bulky, poor quality forage is not recommended because of its poor digestibility and lower levels of nutrients.

High quality pastures can be used as the initial source of nutrition. Intake patterns should be observed to ensure horses are eating. Restricting horses to limited grazing may be necessary on pastures with moderate to lush vegetation. In these situations, turning horses to pasture three to four times a day for one or two hours is a logical starting point.

Grains can be introduced into the feeding program after using forage for the first several days. By doing so, horses are consuming most of the intake of carbohydrate as fiber rather than starch. However, note that not all processed feeds are high in starch. Soyhull pellets, alfalfa meal pellets, or other high fiber by-products may be a logical alternative to long stem forage if lower starch, higher fiber rations are desired.

Grains will provide a more concentrated source of useable energy as compared to a high fiber feed because starch will be more digestible than fiber. As such, it is advantageous to introduce grains soon after the initial refeeding period of one to four days. Grains should be fed in several small meals per day, and amounts gradually increased to levels typical of horses of similar size and weight when in moderate condition. Feeding amounts for a 900 to 1,000 pound horse can start at one to two pounds of grain per day for the first two to four days, and increased to twice that amount by seven to ten days. Feeding frequency of grain can be reduced to two to three times per day sometime during the second week of feeding. Horses should be monitored closely for signs of laminitis or founder. These conditions are evidenced by reluctance to move, walking very gingerly or tenderly, increased time spent lying down, or rocking back on the hind legs before moving the front legs. A veterinarian should be contacted immediately when any of these signs are observed.

⁷ Witham, C. L., and C. L. Stull. 1998. Metabolic responses of chronically starved horses to refeeding with three isoenergetic diets. *JAVMA* 212(5):691-696.

⁸ Stull, C. 2003. Nutrition for rehabilitating the starved horse. *J. Equine Vet. Sci.* 23(10):456-457.

There are differences in the nutrient content of commercially prepared concentrate feeds. Some mixes have large amounts of fiber added to a grain, and are labeled as complete feeds. These mixes can substitute the need for forage more so than mixes containing larger amounts of higher starch containing ingredients. These feeds will usually have increased fat levels by inclusion of plant oil to the mix. Supplying supplemental oil as part of the processed mix, or supplementing grain mixes and pelleted high fiber feeds by topdressing an oil, has the advantage of increasing the energy density of the feed. Vegetable oil contains much more energy per weight as compared with high carbohydrate, low fat feeds.

There is little information as to determining the need for increasing levels of protein above amounts normally recommended to be fed to horses of similar size. However, protein tissue may have been broken down, thus requiring a need for protein growth during refeeding. As such, it is logical to suggest protein requirements are increased to represent levels more characteristic of younger horses in similar growth. Increasing the suggested requirement for crude protein by about 20 percent above normal maintenance levels may better meet needs during initial refeeding of poor conditioned horses. As an example, a 1,000 pound horse may require approximately 1.25 pounds of crude protein in maintenance conditions. When refeeding a poor conditioned horse of similar size, requirements for crude protein may increase to 1.5 pounds of crude protein per day. To determine the protein intake of a horse, the amount of ration by weight is multiplied by the percent crude protein of the ration. For example, a horse consuming an all alfalfa hay ration, which is 20 percent crude protein at levels of 10 pounds per day, would be consuming two pounds of crude protein.

Similar adjustments to minerals and vitamins could be assumed for similar reasons when refeeding a poor conditioned horse. As such, grains and complete feeds formulated for horses in growth may have advantages of use for refeeding as compared to formulations with fewer nutrients per pound intended for horses at maintenance.

Total intake of feed will be limited to the horse's level of appetite and the maximum voluntary intake. In most situations, horses will voluntarily consume as much as 3 percent of body weight per day in diet dry matter. While the dry matter of pasture can vary greatly, most grains and hays are about 90 percent dry matter. For example, a 1,000 pound horse may be expected to consume as much as 30 to 35 pounds of hay per day voluntarily. In some situations, the appetite of the horse will restrict voluntary intake to levels much lower than normal when the horse is in poor condition. Also, a grain mix will likely be combined with hay when refeeding poor conditioned horses. The addition of a higher energy feed will decrease the need to feed rations at maximum levels of voluntary intake.

Accurately assessing improvement is important. Initial body weight and weight gain should be recorded. Weigh tapes can be used if large animal scales are unavailable. Weight gain is expected to be highly variable between horses. Initial weight gains of one to two pounds per day would be expected for favorably responding horses with a body weight between 900 and 1,000 pounds. Significant weight gains sufficient to change body condition score will take a minimum of several

weeks. Also, veterinarian assessment of health should be routinely scheduled as part of the refeeding plan.

Related health factors, degree of emaciation, and the horse's response to refeeding will direct the refeeding plan, so use the suggestions as a general guide. Also, incorporate general feeding management guidelines used for healthy horses as described in OSU Extension Fact Sheet F-3973 Feeding Management of the Equine.

Body Condition Scores

- 1 Pool. Animal extremely emaciated. Spinous processes (portion of the vertebra of the backbone which project upward), ribs, tailhead, and bony protrusions of the pelvic girdle (hooks and pins) projecting prominently. Bone structure of withers, shoulders, and neck are easily noticeable. No fatty tissues can be felt.
- 2 Very Thin. Animal emaciated. Slight fat covering over base of spinous processes and transverse processes (portion of vertebrae which project outward) of lumbar (loin area) vertebrae feel rounded. Spinous processes, ribs, shoulders, and neck structures are faintly discernable.
- 3 Thin. Fat built up about halfway on spinous processes, transverse processes cannot be felt. Slight fat cover over ribs. Spinous processes and ribs are easily discernable. Tailhead prominent, but individual vertebrae cannot be visually identified. Hook bones (protrusion of pelvic girdle appearing in upper, forward part of the hip) appear rounded, but are easily discernable. Pin bones (bony projections of pelvic girdle located toward rear, mid-section of the hip) not distinguishable. Withers, shoulders, and neck accentuated.
- 4 Moderately Thin. Negative crease along back (spinous processes of vertebrae protrude slightly above surrounding tissue). Faint outline of ribs discernable. Tailhead prominence depends on conformation, fat can be felt around it. Hook bones are not discernable. Withers, shoulders, and neck are not obviously thin.
- 5 Moderate. Back level. Ribs cannot be visually distinguished, but can be easily felt. Fat around tailhead beginning to feel spongy. Withers appear rounded over spinous processes. Shoulders and neck blend smoothly into body.
- 6 Moderate to Fleshy. May have slight crease down back. Fat over ribs feels spongy. Fat round tailhead feels soft. Fat beginning to be deposited along the sides of the withers, behind the shoulders, and along sides of neck.
- 7 Fleshy. May have crease down back. Individual ribs can be felt, but noticeable filling between ribs with fat. Fat around tailhead is soft. Fat deposited along withers, behind shoulders, and along neck.
- 8 Fat. Crease down back. Difficult to feel ribs. Fat around tailhead very soft. Area along withers filled with fat. Area behind shoulder filled in flush. Noticeable thickening of neck. Fat deposited along inner buttocks.
- 9 Extremely fat. Obvious crease down back. Patchy fat appearing over ribs. Bulging fat around tailhead, along withers, behind shoulders, and along neck. Fat along inner buttocks may rub together. Flank filled in flush.

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