

Important factors to consider when using Digestible Energy (DE) to compare commercial feed products

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An important measure of a horse feed's value is its energy content. Energy content or energy density determines how much feed must be fed to meet the horse's energy requirement. How much you need to feed then determines the concentration of all other nutrients in the feed. Diets tend to be formulated initially to meet the energy needs of the horse and then adjusted regarding protein, minerals and vitamins. Therefore, horse feeds cannot be properly formulated without knowledge of their energy contents.

Measuring Energy

Unfortunately it's not possible to directly measure the amount of useful energy contained in feed in a single laboratory test. These tests or analytic procedures are readily available to measure other variables such as protein and minerals. Energy is supplied to the horse via its diet, but fundamentally energy is not a nutrient but rather the capacity to do work. Therefore, we are trying to measure the ability or the efficiency of feed energy to be converted to chemical energy or work. The potential energy in a feed is influenced by the type and amount of carbohydrate, protein, and fat that is contained in the feed. It is also influenced by the efficiency of digestion and metabolism of a feed.

Energy content of feed is measured in units called calories. What then is a calorie? In nutrition terms, the

word Calorie (with a capital C) is the amount of energy required to raise the temperature of one liter of water one degree centigrade at sea level. A Calorie is same as a Kilo-calorie (Kcal) which is actually utilized in analytical procedures. For horses, their feeds are usually reported in Megacalories (Mcal) which is 1000 kilocalories. In the animal feeding industry energy can be reported in four categories: Gross Energy (GE), Digestible Energy (DE), Metabolizable Energy (ME), and Net Energy (NE). Gross Energy is actually the only value that can be truly measured in a laboratory. Gross Energy is the total amount of heat produced from the combustion of that feed. The other energy values are based on calculations from countless years of animal research. For example, Digestible Energy (DE) the value utilized in equine nutrition is calculated by subtracting the gross energy in the feces from the gross energy consumed by the animal. In other words, the Digestible Energy is the amount of energy an animal consumes minus what is lost in the manure. This is only an estimate of digestible energy as some of the material excreted in the feces does not originate from feed but from cells sloughed off the gastrointestinal tract

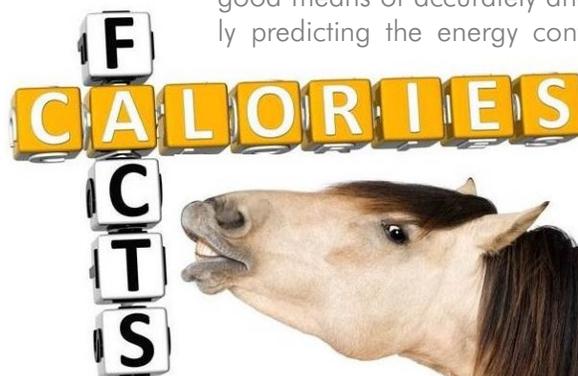
as the food passes through. Metabolizable energy is calculated by subtracting the urinary and gaseous losses from DE. Net energy starts with ME and also takes into account numerous variables from energy stored in tissues to heat losses.

Digestible energy is considered fairly archaic by most other livestock species when describing the energy content of feed. This is in part due to the large differences in how efficiently the Digestible Energy is utilized from different feedstuffs. Therefore DE values should only be viewed as a calculated value not an exact measure.

In America the energy content of horse feed is expressed as digestible energy (DE, Mcal/lb).

Energy Calculations

While there are several equations used to estimate DE we still lack a good means of accurately and easily predicting the energy content of





different feeds. The equation shown is commonly used; however, it does not accurately predict the DE content of some high fiber feeds and feeds that are high in fat. Several other commonly used equine feed ingredients were approximately 40-50 % higher in DE when actually measured in controlled digestion studies compared to predicted values. This inadequacy of the current equation to accurately predict the DE content of feeds higher in digestible fibers and fats becomes very important considering commercial equine feeds on the market today incorporate high amounts of readily digestible fibers and fat. The most accurate way of measuring DE is to carry out digestion trials for all feeds and feed ingredients. These however are very time consuming and costly to carry out. Research has also shown that digestibility may be affected by individual variation, exercise and diet form. More accurate

systems of energy evaluation utilizing net energy have been developed, but have not been placed into widespread use because of a lack of information about NE requirements for various classes of horses and the NE contents of different feedstuffs.

There are no regulatory bodies telling equine feed manufacturers which method or equation to use to estimate energy content of feed. This means companies can use whatever system they want to predict DE and this can potentially be very misleading to the end user. A feed could be represented as a low energy feed when in fact it is not.

This inconsistency in standardization and prediction of energy content of feedstuffs undermines the selection of horse feeds based solely on the energy content of the feeds. It also makes it virtually impossible to compare energy contents of feeds between different manufacturers. Therefore DE values should not be relied upon when making decisions about what feed is right for your horse.

Whilst we would like to share our estimates of DE, we feel that it is not in the best interests of the consumers to add this information to our tags. We need to standardize the

Other balances relating to energy sources in the diet should be considered when selecting feeds for individuals including:

1. Sufficient carbohydrate to help maintain ample energy without overloading the digestive capacity of the horse or causing metabolic disturbances.
2. Adequate fat to maintain the required energy without negatively affecting palatability and gastrointestinal function.
3. Sufficient fiber to maintain normal gut and digestive function and limit behavioral disturbances.

prediction equations the feed industry as a whole use to calculate DE, so that the end user can actually compare between companies. We also need to devise more accurate methods of determining energy content of feeds as has been done in other livestock species.



Commonly used formula for calculation of Digestible Energy:

There are several different ways to predict DE content, and this has led to a great deal of confusion about how much DE is actually in a horse feed. The most common method to predict digestible energy uses the chemical composition of the feeds and is described in the following equation recognized by the NRC 2007:

$$DE \text{ x (kcal/kg DM)} = 2118 + 12.18 \text{ x (\%CP)} - 9.37 \text{ x (\%ADF)} - 3.83 \text{ x (\%hemicellulose)} + 47.18 \text{ x (\%fat)} + 20.35 \text{ x (\%non-structural carbohydrate)} - 26.3 \text{ x (\%ash)}$$

Where hemicellulose = Acid Detergent Fiber (ADF) – Neutral Detergent Fiber (NDF) & Non Structural Carbohydrates (NSC) = (100 - %NDF - %Fat - %Ash - %CP).

Equine Disease Series Part 1 : Obesity

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WHAT IS IT?

An obese horse is one that has accumulated so much body fat that it begins to have a negative effect on health.

WHAT ARE THE SYMPTOMS?

Obesity has a number of potentially negative effects, including: increased stress on the heart and lungs, greater risk of laminitis or founder, increased risk of developmental orthopedic (bone and joint) problems in young, growing horses, more strain on feet, joints, and limbs, worsened symptoms of arthritis, less efficient cooling of body temperatures, fat build-up around key organs which interferes with normal function, reduced reproductive efficiency, greater lethargy and decreased performance.

WHAT ARE THE CAUSES?

The causes of obesity in horses are simple: too much energy (calories) consumed, too little exercise and certain medical conditions. Management of the obese horse requires



changes in the feeding program as well as the exercise program.

DIAGNOSIS:

The best way to determine if your horse is obese is to body condition score them. (http://www.poulingrain.com/resources/body_scoring_chart.pdf)

Body condition scores go from one through nine. One meaning very skinny and nine meaning obese, ideally, you want your horse to be around a five. A horse that is a five has a flat back, its shoulders and neck fade into the body smoothly, and the horse's ribs are not easily noticeable.

FEEDING & MANAGEMENT:

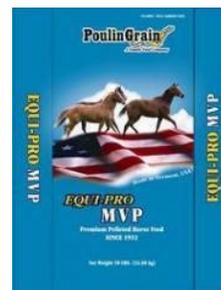
Weight reduction will only occur if the horse's energy expenditure is greater than its energy intake. Weight loss can only be accomplished by reducing the number of calories going in and increasing the number of calories expended. So a combination of diet and exercise is in order to shed extra weight from the easy keeper. If turnout space is limited or unavailable, the horse should be exercised regularly, provided it is sound and healthy. This is one of the best options for weight loss, especially if the horse is usually sedentary. If possible, exercise the horse more often than it had been before dieting, to

increase the rate of weight loss. If an exercise or dry lot paddock is available, where there is no pasture available for grazing, regular turnout will allow for increased activity and weight loss.

Don't feed high-fat supplements. Vegetable oil, flaxseed and rice bran are high in fat and they are high in calories. Eliminate these supplements from your horse's diet and you can cut out a large number of calories and prevent excessive weight gain. Limit access to pasture by using a grazing muzzle and replace legume hay with grass hay. Legume hay, such as alfalfa and clover, contain more calories per pound than grass hays. Instead of alfalfa, feed a high-fiber, good quality grass hay free of dust, mold and weeds. Commercially available "balancer supplements" are ideal for these horses as they provide the animal with its mineral and vitamin requirements without adding excess calories.

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MYTH BUSTER



Myth - Horses prefer pond water over tap water.

BUSTED

Horses prefer cool clean tap water, pond water is often stagnant allowing the growth of bacteria which can be harmful to horses. Pond water can also take on the flavor of anything contaminating the water such as leaves, manure etc. that reduce the palatability of the water.

If your horse is sensitive to changes in water taste when you travel try flavoring the water at home with some apple juice and doing the same with the new water.



Did you know - Horses have around 205 bones in their skeleton.— The skeletal system of the horse has three major functions in the body. It protects vital organs, provides framework, and supports soft parts of the body. Horses typically have 205 bones. The pelvic limb typically

contains 19 bones, while the thoracic limb contains 20 bones.



Did you know – Horses use a range of different vocalizations to communicate. Whinnying and neighing sounds are elicited when horses meet or leave each other. Stallions perform loud roars as mating calls, and all horses will use snorts to alert others of potential danger. Mares (adult female horses) use deep smooth sounds, whickering, when they are nursing a foal.

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