## **OVERWEIGHT/OBESITY IN YOUR FRIESIAN HORSE:** HARMLESS CONDITION OR A PROBLEM THAT NEEDS TO BE TACKLED?

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## PART 1

fust like in human, obesity has become a real epidemic in dogs, cats and horses. Recent studies report obesity prevalence ranging from 59 to 65% in dogs and cats. Equine studies report prevalence ranging between 20-50% of the horse population. In the Friesian horse population, obesity is also a problem. It is not uncommon for jury members of horse shows to express their concerns: "This horse is overweight. It would move much better if it wasn't so fat." Unfortunately, that's most often true: the horse is either fat or fit. There are several reasons why obesity has become such a fast growing problem. Recent studies have shown that the chance that a dog will become obese during its lifetime significantly increases when its owner is obese. This proves that we tend to "humanize" our pets. Whether this is also the case for our horses is not clear, but for sure, this finding was a real eye opener for researchers. The reported prevalence of obesity is astonishing, however, this is reality and something needs to be done to turn the tide. Obesity in the horse does not happen without complications and needs to be viewed as the catalyst of numerous problems, some of which can be fatal for your horse. We want to shed a light on the latest scientific views concerning obesity, because the scientific world has gained a lot of knowledge the last decade concerning fat tissue and obesity. We also want to provide some tools to prevent and manage obesity in a successful way. There are two important strategic approaches for horse owners: knowledge and awareness. It's important that a horse owner knows how harmful being overweight is for horses and that they be trained to properly recognize in a timely way that their horse may be becoming overweight.

#### Genetic Background and Predisposition

Just like in humans, genetics are important when it comes to obesity. In some families, many family members suffer from being overweight, whereas in other families most family members are lean. In horses, we see the same, especially when we look at different breeds. Some breeds like the Shetland pony, the Icelandic horse, the Fjord and the Haflinger have a history of living under harsh conditions in the highlands. These breeds have learned to cope with unfavourable weather conditions and most importantly periods of food scarcity. This explains why food sources upon which other horse breeds couldn't thrive such as low quality straw. These breeds are often called "easy keepers" and the Friesian horse shows many features that are typical for "easy keeper" breeds. In a nutshell: easy keeper breeds are more prone to develop obesity than, for example, Standardbreds. Especially in the luxurious conditions we tend to keep our horses nowadays. These conditions absolutely do not resemble the natural habitat and natural way of living of these "easy keeper" breeds. In human medicine, obesity is defined when the Body Mass Index (BMI) exceeds 30. The formula to calculate your BMI is your weight (kg)/(body length)2. In horses we can't use the BMI, however we use "Body Condition Scoring."

over the course of centuries, due to natural selection, these

horses have a genetic make-up that enables them to suck up

like a sponge all of the energy out of any food source, even

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Becoming overweight is the consequence of a positive energy balance: there is more energy input compared to energy output. In the wild, horses graze 60-70% of the day on poor quality pasture while moving around constantly and walking about 50 km per day. This doesn't remotely resemble how we keep our horses nowadays. On top of that, hormonal changes around autumn ensure that horses start to develop fat deposits to cover energy demands in the winter period. That's nature. The genes of our domestic horses don't know that these horses will stay in a warm cozy stable during winter, with plenty of feed and water. Also, the quality of horse feeds has significantly increased the last decade. On top of that, we put our horses on rich pastures. treated with fertilizers, because we also want to produce our own hay if possible. Add to that, many of us also feed pounds of grain concentrates. Due to hectic schedules, many of us have very little time, so we are happy when we can ride our horse once or twice a week. Keeping in mind the above scenario, it's actually a self-fulfilling prophecy that obesity will further boom in our horse population. So genetics are important, knowing that some horse breeds are more prone to develop obesity than others. But also management and logical thinking are important. If you provide more energy to the horse than it's going to use. you create a positive energy balance, and if that positive energy balance lingers on long enough, you get obesity.

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## physiological Role of Fat Tissue

Inside the body, fat tissue, or using a more scientific name, adipose tissue is deposited at certain preferential locations. In man, for example, fat tissue is predominantly deposited at the level of the belly, more precisely inside the abdomen, in between the abdominal organs and subcutaneously (underneath the skin) at the level of the abdomen. In most women, fat tissue is predominantly deposited at the level of the hips. In horses, fat can be deposited inside the abdomen, subcutaneously and at the level of the neck (cresty neck).

Fat tissue needs to be viewed as the most dense energy reserve present inside the body. There is no other kind of tissue that can provide as much energy on weight base than fat tissue. Most tissue cells, such as muscle fibres, use ATP as energy source. ATP is for the body like kerosene is for an airplane. An airplane doesn't fly on diesel but instead requires kerosene as fuel. The body can use several different sources to create ATP which in turn is used as definitive fuel to realize all kinds of body functions, such as locomotion, but also kidney and liver function, etc. Fat tissue is one of the sources to create ATP; glycogen is another example of a source that can be used to create ATP. For comparison: 1 mole glycogen can create 3 moles of ATP; 1 mole of fat tissue can create 460 moles of ATP. No wonder we see fat tissue as the most dense energy reserve present inside the body. However, fat tissue is much more than that. Twenty years ago we used to see a fat deposit as an inert heap of energy, waiting inside the body, ready to be broken down as soon as extra energy is needed. Nowadays we know that fat tissue is actually very active. It's the largest endocrine organ inside the body. This means it needs to be viewed like any other endocrine organ inside the body, similar to the thyroid gland or the adrenal gland. Indeed, it produces a wide array of hormones such as leptin and adiponectin. Since fat tissue is everywhere inside the body, it needs to be viewed as the largest endocrine gland present inside the body. But it is even more complicated than that. Besides a wide array of hormones, fat tissue produces large amounts of pro-inflammatory mediators, which are chemical substances that promote inflammation. Now, you understand that any human or animal that is obese actually is in a status of continuous inflammation. No wonder all kinds of pathological conditions manifest themselves with increased prevalence in obese animals and people.

If that isn't enough it gets even more complicated. We also know now that fat tissue actually communicates with other organs inside the body, such as the brain (fat-brain axis), the liver (fat-liver axis) and the microbiome inside the gut (fatgut axis). Indeed, studies have shown that substances that are produced by fat tissue communicate certain messages to the brain. Likewise, scientists have shown that there are actual nerve fibres that course from the fat tissue to the brain and provide the brain with input information. Information can also travel in the other direction, as there are also nerve fibres from the autonomic nerve system that course from the brain to the fat tissue and give certain assignments to the fat tissue. Some of the substances produced by fat tissue influence eating behavior and mood. On the other hand there are direct nerve projections from fat tissue towards the liver. The liver

needs to be viewed as "the CEO" of the energy metabolism of the body. It knows everything with respect to the body's energy metabolism and plays a very important role in keeping everything in balance. Researchers have also shown recently that important communication takes place between the fat tissue and the microbiome inside the gut. Since techniques have been developed to actually identify DNA of all bacteria inside the gut, researchers have obtained a better and more exact view of the composition of the gut microbiome. We know now that the composition of this gut microbiome differs greatly between different people, depending on genetics, environment, and most importantly, diet. The gut microbiota produce substances that pass the intestinal barrier and go into the systemic circulation, by means of which they reach the fat tissue and communicate with it. So, fat tissue is actually a very busy tissue, and not an inert hype of energy waiting to be burned when extra energy is needed for the body.

### Can Excessive Weight Harm Your Horse?

Keeping in mind that fat tissue actually needs to be viewed as an enormous factory that produces all kinds of hormones and substances that promote inflammation, we shouldn't be surprised that obesity is associated with all kinds of diseases in humans, such as cardiovascular disease, different types of cancer, fertility problems, diabetes type 2, etc. In horses, obesity is associated with an increased risk for occurrence of orthopedic problems such as bone, joint and tendon injuries, severe colic due to lipomas (benign fat tumors in the abdomen of the horse that can entangle pieces of intestine), heat intolerance, insulin resistance and laminitis. The latter two occur with the highest prevalence.

Heat intolerance is caused by the fact that fat deposited underneath the skin acts as an insulation barrier. This layer is useful during cold winter times. However, when an obese horse needs to perform exercise, it can't get rid of the heat as easily as a lean horse. As a result body temperature rises, the horse sweats extensively, the respiratory rate increases, the heart rate increases and finally performance capacity decreases. So it is important to keep in mind that overweight horses are more likely to overheat during exercise when compared to lean horses. Moreover, they will lack stamina, which is a more technical word for aerobic capacity, which is defined as the ability to perform exercise without production of lactic acid. Horses that are overweight will tend to switch quickly to anaerobic glycogen burning to produce the necessary ATP to be able to perform exercise. However, lactic acid is produced as well, and that's a real showstopper, because lactic acid is truly an acid and, as such, it will acidify the muscles and can lead to exhaustion of the muscles and thus a horse that can't perform.

Insulin resistance is the other important problem that occurs in the face of obesity. This is the reason why Diabetes Type 2 is encountered in many human patients suffering from obesity.

Excessive fat storage can alter the body's sensitivity to the activity of the hormone insulin. The pancreas produces insulin as soon as you begin to eat a meal. The nutrients inside the meal will be broken down into smaller units by the digestive enzymes inside the intestine, after which they are taken up into the blood



stream causing blood glucose levels to rise after ingestion of the meal. In answer to that rise, the pancreas starts producing insulin to guide the glucose out of the blood towards the fat tissue and the muscle cells. Insulin stimulates fat and muscle cells to take up the glucose so it can be stored as energy reserve, to be used later on to produce ATP necessary to perform exercise. Insulin is thus an important anabolic hormone that regulates blood glucose levels. However, in case of insulin resistance, the pancreas can produce as much insulin as possible, but it won't have an effect on blood glucose levels, because the tissues aren't sensitive anymore to its action. The results are high blood glucose levels in conjunction with high blood insulin levels. Recurrent high blood glucose levels are very unhealthy and the specialized cells inside the pancreas that produce insulin will get exhausted. Horses that do not respond effectively to insulin are called 'insulin resistant.' The blood glucose concentrations in these horses can be very high (hyperglycaemia) after meal uptake. The pancreas will react with the secretion of even more insulin (hyperinsulinemia), but without effect.

Obesity in horses is clearly associated with an increased risk for developing laminitis, also known as "founder." Laminitis is one of the most painful conditions that a horse can suffer from and it is not uncommon for laminitis to be the reason why the sports career of a horse ends or the horse even needs to be euthanized for reasons of welfare. It entails acute inflammation of the living laminae inside the hoof and this can lead to a chronic condition that requires lifelong management by a knowledgeable and dedicated team comprised of a farrier, veterinarian and owner. A discussion of laminitis could fill an entire article, but suffice it to say that prevention is the best "cure." It is in both the horse's and the owner's best interest to work hard to feed and manage a horse to keep it from becoming overweight/obese to ward off this potentially debilitating and even life-threatening complication.

### How Do Horses Become Overweight?

We can't be clearer on this one: a horse doesn't become overweight by accident. We, as horse owners, play a crucial role in that matter. The most common cause is overfeeding relative to the activity level of the horse. This is especially true for those breeds designated as "easy keeper breeds." It is easy to overestimate the actual energy needs of a horse. Many horse owners feed their horses as if they were racehorses. As a result, the horse becomes not only obese, but often also quite nervous and even difficult to handle while riding, which can result in the use of all kinds of supplements to calm down the horse. It seems weird, but that is what we see in many sport and breeding stables.

Horses can easily handle hours of low-intensity work on a diet based upon feeding good quality roughage such as grass hay. Most horse owners perform only short recreational rides a couple of times a week. This is not comparable with the exercise that is performed with a racehorse that uses lots of energy.

Pasture management is important consideration as well. The grass types that are used nowadays are often ideal to sow a meadow for milking cows. The richer in proteins and carbohydrates (sugars) the meadow is, the more milk the

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milking cow will produce. However, for horses this grass is quite rich and energy dense. Horse owners need to realize that pasture turn out not only entails exercise, but also the important amount of calories taken in by the horse while grazing. These need to be counted in when calculating the energy need of a horse. For example, when you leave a horse 24 hours at pasture, it will graze approximately 17 hours, hereby taking up approximately 0.5 to 0.6 kg grass/hour, that is 11.3 kg grass in total! If you look at how much calories that represents, you will be surprised. Depending on the grass type, values for a young growing pasture have been reported on a 100% dry matter basis: 1.34 MCal (Mega Calories)/LB; Bahiagrass (0.92 MCal/LB; Coastal Bermuda Grass (1.08 MCal/LB); Kentucky bluegrass (0.95 MCal/LB); Orchard grass (1.04 MCal/LB).

There are different management measures that can be taken to actually control grass intake in horses during pasture turn out. You can apply the "leader-follower" approach. In that case first the horses that do need a lot of energy (e.g., heavy work, growth, lactation) are turned out, followed by the "easy keepers." Another option is for other animal breeds such as cattle, sheep or goats to be turned out prior to the easy keepers. There are not a lot of parasites that cross infect between cattle and horses or sheep and goats and horses. So, in that respect, there is minimal concern. Another strategy for controlling pasture intake that is often used is to restrict the time allowed for grazing. However, we will see later on that that approach often is unrewarding. Finally, turning out the easy keepers on paddocks, or the use of a grazing muzzle, is also an effective measure, especially to control weight.

## **CONTINUED IN PART 2, NEXT ISSUE!**

