

Baby Its Cold Outside

In case you didn't notice, it has been just a little cold the last few weeks. So many horse and non-horse people are probably wondering whether their horse needs to slip on its wintery best blanket and snuggle up for the long winter's night.

Most horse owners are aware of the damage and crisis inherent with fever states. But few horse owners realize how well adapted horses are to deal with cold when certain aspects of their lifestyle have not been altered by humans. In order for a horse to survive, internal body temperature is kept within a very narrow range. If the temperature exceeds these limits either above or below, the chemical reactions on the cellular level function improperly, or they stop functioning at all.

Over thousands of years, the wild horse has spread over the entire world. Whatever place in the world they live, the horse is exposed to constantly changing temperature from night to day. Even today wild and semi-wild horses, as well as domestic ones survive perfectly any weather conditions. Whether it is the north of Europe, or Australian deserts, the horse is exposed to all of Nature's changing elements—wind, sun, rain, snow, fluctuating temperature, etc. No need for excessive enclosed shelters such as stables and barns or caves. Never in nature is the horse seeking ways of covering themselves with fabric. The horse has naturally evolved ways of thriving.

The Corrales domestic horse is the same as its wild counterpart: it has the same abilities to survive. Basically, they do not need anything more from us humans than what nature provided. Here is what is needed: freedom of movement 24 hours a day, free access to appropriate food 24 hours a day, herd life, proper hoof care, shelter which it can enter and leave freely. Given these simple things the domestic horse is able to properly use its amazing natural thermoregulatory abilities exactly the same way as the wild horse. The danger comes when we make our horse a subject for anthropomorphism through stabling, changing eating habits, blanketing, clipping, shoeing, etc.

Blanketing a horse can make the thermoregulation in a horse a complete mess. The animal tries to warm up parts of the body left exposed to the cold such as head, neck, belly and legs, in the process they become over-heated in those parts covered by the blanket. A horse cannot increase heat in selected areas of the body. The whole body cools or the whole body heats up. Sweating under a blanket is more of a problem metabolically to the horse than people realize.

Remember, due to thermoregulatory factors such as the skin and coat being very good insulators, which prevent heat loss, and the muscles producing heat through their movements, it is far easier for horses to warm up in cold weather than to cool down in hot weather. Cooling down is more difficult for the horse. Horses are adapted to handle cold. The horse's skin is responsible both for protecting the interior of the body from outside temperature changes as well as not allowing heat loss in cold weather. The skin is

also responsible for dissipation of internal heat generated by muscle action to prevent the body from over-heating. The skins' thermoregulatory mechanisms consist of four major factors, skin, coat, arteries and sweat glands, three of which are responsible for keeping the horse warm in a cold weather.

The skin itself works as an insulating layer through its relative thickness.

The coat insulation depends on the depth and thickness of the hair layer, the wind speed and the temperature and humidity gradients within the coat. The coat, in horses, changes twice a year through the mechanism called photoperiodism, adapting to different seasonal base temperatures. Sensors in the horse's skin react to the daytime light length changes. The horse is ready to grow their winter coat right after the summer solstice, when days start getting shorter. The horse is ready to change their winter coat to a summer one right after the winter solstice, when days start getting longer. In addition to photoperiod, environmental temperature also affects hair growth. Colder climates produce thicker and longer coats in horses than warmer climates do, when comparing horses who have the same body score and are fed the same amount of food. Also, coat growth is affected by some other factors, for example, feeding and breed. In addition to growing its coat, the horse can increase the insulation of the coat through the mechanism called piloerection — raising, lowering or turning in different directions the hair in the coat via hair erector muscles. This way the horse increases or decreases the thickness of the insulation layer and efficiently varies the amount of airflow to the skin surface. Piloerection increases coat depth 10% to 30% in mature horses. The hair erector muscles must be exercised regularly in order to work properly, as with any other muscle in the body. Hairs of the coat are also covered with a greasy substance, which helps the horse not get wet to the skin on rainy or snowy days. The coat has a water-repelling effect through the hair grease — water runs down the outer hair while the deeper coat remains dry. The longer the coat, the less chance water has to get to the skin. Through regular coat brushing the greasy substance gets removed, and the water-repelling effect gets impaired. It is not advisable either to clean off the layer of dirt that rolling in mud gives a horse. The mud has protective effects to the body. Needless to say, that the popular practice of clipping the hair of a horse's coat eliminates, completely, the thermoregulatory factor of the coat.

The arteries in the skin through muscle actions, called vasoconstriction or vasodilation, can be narrowed or enlarged, regulating blood flow to the skin. Constricting prevents internal heat loss by reducing the amount of warm blood brought to the cooler body surface. Dilation allows for a larger amount of hot blood from over-heated interiors to reach the body surface and to be cooled. The cooled blood lowers internal body temperature when it's returned back to the interior of the body.

The sweat glands in the horse are used to cool down at a time when external or internal temperatures are too hot. When the outside temperature is too high for the air to cool the blood through the skin, the sweat glands secrete fluid. Evaporation of this fluid cools the skin surface and the blood in the surface arteries. In this way, bringing the cooled blood to the internal body, the temperature internally can be lowered even when it is hot outside. The horse stops secreting sweat as soon as the internal body

temperature has reached its norm. Then it must dry quickly, since otherwise cooling would continue and bring body temperature below normal limits. A sweaty horse turns its coat hairs in various directions in order to avoid under-cooling and given freedom usually seeks a windy spot to effectively and safely dry itself. Mentioning the sweat glands mechanism is important because sweat glands are also brought into function through muscle action.

The amount of fat in the body is also an important factor of thermoregulation. In addition to being the body's energy reserve, fat is three times more insulating than other tissues due to its low thermal conductivity and poor blood supply. Thus it is important for a horse to have a good layer of fat before winter. Wild horses and naturally kept domestic horses maintain the natural rhythm of weight change throughout the year with their weight growing up to 20% by the Autumn. Also fat gets distributed more evenly over the body surface in cold conditions instead of being concentrated in some particular areas as in hot conditions.

Large size horses have less relative surface area available for heat exchange, and thus importantly lose less heat in the cold than small size horses do. Northern breeds of horses are rounder than warm climate southern breeds of horses.

Increasing feed intake increases heat production in the horse's body. The process of digesting long fibers produces heat as a by-product. It is important that every domestic horse has unrestricted access to hay 24 hours a day in cold weather, having a chance of increasing heat production through continuously consuming and digesting long fiber. This is especially important when some of the other thermoregulatory mechanisms aren't yet adjusted in suddenly changing weather such as a rapid drop in temperature.

Along with general reduction of activity in the cold, you have probably observed in horses standing or lying down very close to each other. In this way they reduce heat loss via radiation. By such positional closeness to each other they reduce the body surface area exposed to the external environment.

Snow which we can sometimes see lying along horses backs during winter also plays the helpful role of providing an extra protective layer against internal heat loss. On windy, rainy days, we can see horses standing with their tails to the wind and their heads low. This way they effectively keep their necks, heads, ears and eyes, underbelly and sheaths out of water and wind. Their tails serve to protect their rear ends — the shorter hairs on the dock fan out deflecting both snow and wind.

Under extreme circumstances, heat in the horse body can be generated by shivering. During shivering, heat is rapidly produced by breaking down ATP in the muscles. Shivering is usually an acute response to sudden cold exposure, or sometimes it occurs during extended periods of exposure to cold in rainy

weather. In healthy animals, shivering is replaced by normal internal heat production as they adapt to new weather conditions.

The natural thermoregulatory mechanisms can only be fully utilized when a horse is kept in their natural i.e. wild living conditions. There is an anxiety and stress factor that horses inevitably experience when cut off from their basic needs and kept in ways unnatural for this species (stabling, separating from equine companions, forced exercising, lack of continuous fiber uptake, etc.). This stress also makes them less capable of coping with cold.

So, as you drive by that pasture filled with horses out in the snow, don't necessarily feel sorry for them. If their owner is wise they will do just fine left to nature's ways.

Thanks to Natalija Aleksandrova for the information in her article and her words of wisdom.