Health Considerations When Housing Horses

MICHIGAN STATE UNIVERSITY | Extension

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There are several horse housing options that each have benefits and drawbacks, but horse health should be in the forefront when planning a facility. Less than ideal housing situations can negatively affect your horse's respiratory and skeletal health. When housing horses indoors, good ventilation is essential for their respiratory health. Poor ventilation can lead to short- and long-term health problems.

A simple three-sided shed provides good ventilation and protection from harsh weather.

RESPIRATORY INFECTION

Symptoms of low-grade airway inflammation (bronchitis) in horses are bouts of coughing, reduced performance and excessive mucus within the air passages. While the cause of airway inflammation is not well understood, it is likely that environmental dusts and antigens are partially responsible. Michigan State University researchers (Holcombe, et al. 2001) found that young horses housed indoors had increased incidence of airway inflammation when compared to a similar group of young horses at the same farm that were kept out on pasture. The stalled horses' increased airway inflammation could result from greater exposure to dusts and antigens associated with bedding, hay and decreased air circulation in the stalls.

HEAVES

Recurrent Airway Obstruction (RAO), commonly referred to as heaves, is a respiratory disease in horses similar to asthma in humans. Poor ventilation is a risk factor, along with dusty and moldy hay. Heaves is usually caused by an allergic reaction to dust or mold found in hay and bedding or by other respiratory irritants such as ammonia. There may also be a genetic link to the disease, as offspring of RAO parents are more likely to contract RAO.

SYMPTOMS

A horse with heaves will have a normal temperature and a good appetite, but it will often also have decreased exercise tolerance, excessive tearing of the eyes, coughing and nasal discharge. The horse will appear winded. Over time a heave line may develop in the abdominal muscles resulting from increased muscle size at the end of the rib cage from the continuous effort required to exhale.

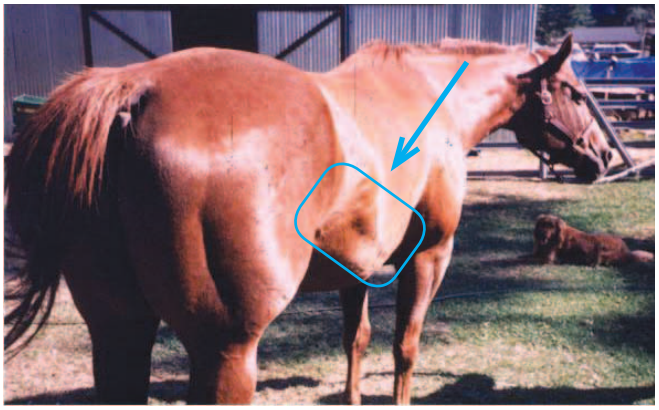
TREATMENT AND MANAGEMENT

The key to managing heaves is to decrease or eliminate exposure to the allergens. Heaves can also be treated with medication to control inflammation or to relax the airway and let normal breathing resume. Some medications can be administered through a mask similar to the nebulizer used for the treatment of asthma in humans.

To decrease exposure, have the horse spend more time outside at pasture than inside. Ideally, the horse should be kept outside as much as possible with a run-in shelter. Here are some other ways to decrease exposure.

- Use dust-free bedding such as shredded paper or rubber mats. Do not use straw, hay or wood shavings if a horse exhibits RAO symptoms.
- Don't feed dusty and moldy hay and grains.
- Wetting down the hay may help, as long as excess hay is regularly removed (to prevent mold).
- Keep your horse out of the stable when you are cleaning to reduce exposure to dust.

- Store hay away from your horse as much as possible and ensure that any hay in the vicinity is kept dry to reduce mold.
- If a horse is housed indoors, ensure that there is good, draft-free ventilation through the stable.



The arrow in this photo is pointing to a heave line along the horse's barrel. The labored breathing during exhalation associated with heaves causes the abdominal muscles to enlarge and develop a heave line. *Photo courtesy of Dr. Hal Schott , Michigan State University College of Veterinary Medicine.*

SKELETON

Skeletal strength, especially in young growing horses, can be influenced by housing. Bone is dynamic tissue that can change in shape and strength because of physical forces and nutritional status. A young horse's skeletal system is very responsive to exercise and diet since the growing bones are elongating and increasing in bone density. Growing bone goes through a process of modeling. Modeling is the process during which growing bone changes shape and strength as a result of physical forces (primarily ground concussion during exercise). Young bone flexes when it encounters large force, a signal to the bone to add minerals for strength. If less bend occurs due to a reduction in force, the bone will remove minerals, becoming weaker.

During the modeling phase, the bone will respond to force by absorbing minerals, thereby increasing bone density (strength). Bone that is not adequately exposed to forces through exercise does not gain that strength and during the growth phase is more prone to injury.

Michigan State University researchers found that stalling young horses can result in lower bone strength when compared to young horses housed on pasture (Hoeksta, et al. 1999). Even when the stalled horses were put through a traditional training program (trotting on the hot walker or ridden at trot and slow canter), the stalled horses' bone strength was weaker than that of their pastured counterparts.

A follow-up study found that sprinting young horses just a short distance each day (50 – 80 meters) was enough force to strengthen the bone (Hiney, et al. 2004). Young horses on pasture have more opportunities for sprinting through play activity. If you need to stall horses, you should also include at least two hours of turnout as part of their daily routine to encourage strong bone development. Horses need at least one-eighth of an acre to exercise. If a pasture is to provide the majority of the horse's forage needs during the grazing season, the stocking rate (animal units per acre) should be 2 to 4 acres per 1,000 pound horse if the pasture is well managed.

Turnout time helps ensure healthy bone development in young horses.

TEMPERATURE REGULATION

Whether horses are housed indoors or out, it is important to provide them with the ability to handle climate extremes. Understanding how horses control their body temperatures to adjust to temperature extremes is essential for providing a healthy and comfortable environment for them. Remember that a person's comfort level in climatic conditions is very different than that of a horse. In addition to their body mechanisms for temperature control (e.g. winter hair coat), horses have adapted to environmental conditions, finding natural

shelters in the trees and terrain and changing their behavioral patterns to adjust to temperature extremes. Weather conditions that typically chase people indoors are often very tolerable for a healthy horse.

A horse's normal body temperature is around 100°F (37.8°C). A horse will regulate its core body temperature through **thermoregulation** to avoid **hypothermia** in extreme cold weather and **hyperthermia** in hot climatic temperatures or heavy exercise. The average horse has a **thermoneutral zone** between 30° and 75° F (-1°C - 24°C) in still air. Healthy horses will adapt to their climate. For example, adult horses acclimatized to mild Canadian winter temperatures had an estimated thermoneutral zone between 5°F to 50°F (-15°C and 10°C). Their bodies' abilities to regulate their temperature, hair coat, and behavior all play a role in thermoregulation.

Definitions:

Thermoregulation: the system by which an animal regulates its internal temperature.

Hypothermia: body temperature decreases significantly below normal.

Hyperthermia: body temperature increases significantly above normal.

Thermoneutral zone: the range in external temperatures within which an animal can maintain its core body temperature without expending energy.

TEMPERATURE REGULATION IN COLD WEATHER

A healthy horse can handle very cold external temperatures if it can keep dry and find protection against severe winds.

A *winter hair coat* is longer and thicker than a horse's *summer coat* and helps insulate a horse's body from cold temperatures. When exposed to cold air, tiny muscles along the skin contract so that the horse's hair stands up in its shaft, keeping warm air trapped to provide a greater degree of insulation from the cold. In addition, the underlying *vessels along the skin* constrict to keep body heat from leaving the body's surface.

A horse's body fat (subcutaneous fat) also offers insulation from the cold. Horses should have a **body condition score (BCS)** of 5 or above—on the Henneke scale of 1 (emaciated) to 9-(obese) (Henneke, et al. 1983)—to provide insulation from extreme cold temperatures.

In addition to a winter coat and body fat stores, a horse generates internal heat though the process of digesting its food. The heat a horse's body produces while digesting forage is greater than the heat produced when digesting grain. Increasing a horse's hay rations as opposed to the amount of grain is a better strategy to help maintain its body temperature in the winter.

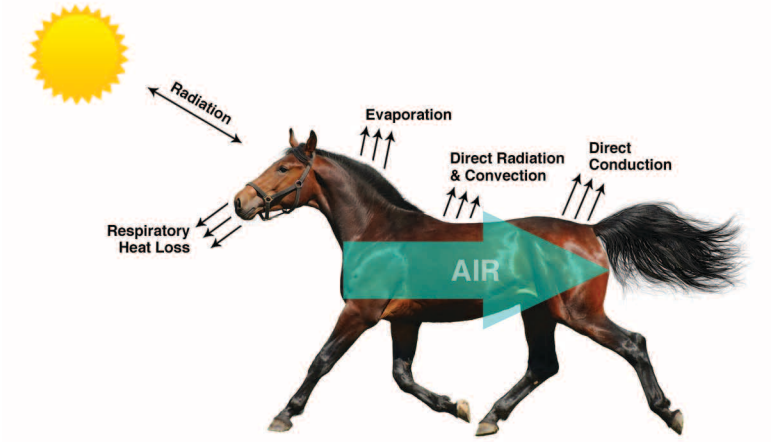
Shivering is another natural mechanism that allows a horse to generate heat to keep warm. As the horse's muscles under the skin rapidly contract and release, body heat is produced. However, shivering also expends energy, so excess shivering will deplete the horse's energy resources and should be carefully monitored.

Horses may also change their behavior to help adapt to cold temperatures. If the footing is good, you may see more play activity like running and bucking, especially in young horses, to generate heat. Horses may also seek other horses and huddle together to help keep each other warm. Horses may seek out shelter from wind, rain or damp snow. A wet hair coat has a lower ability to insulate the horse from extreme temperatures because the hair coat flattens and the warm air insulation layer is lost. Ensuring that a horse has access to a wind break and shelter from rain and wet snow is essential for helping regulate its body temperature in extreme cold weather. In addition, horses with short hair coats or a body condition score of 4 or below should wear a water-proof blanket during turnout to provide them extra protection against extreme cold.

Healthy horses can easily handle cold weather. Horses should be provided with a wind break and a way to stay dry during weather extremes.

TEMPERATURE REGULATION IN HOT WEATHER

A healthy horse will also adapt to hot climates over time. A horse generates body heat through the process of digestion, as well as through physical exercise. From an environmental standpoint, you need to be concerned not only with the outside temperature but the humidity level. During hot weather or heavy exercise, a horse will need to expel body heat into the environment to avoid overheating. The horse can dissipate body heat through conduction, convection, radiation and evaporation.



A horse can lose and gain heat through radiation, evaporation, convection and conduction.

Conduction is the process of losing heat through physical contact with another object or air. As long as the surrounding environmental temperatures are below a horse's surface temperature, that horse can dissipate heat by being in direct contact with the surrounding ground and air through conduction. Conduction alone does not play a major role in heat loss for horses.

Convection is the process of dissipating heat through the movement of air or water molecules across the skin. A horse can lose heat by cooler air or water moving over its surface. The rate of heat loss by convection is influenced by how rapidly the air flows past the animal. In addition, the difference in temperature between the surface of the horse and the temperature of the air plays a role. As the air temperature approaches the horse's skin or hair temperature, the rate of heat loss by convection slows down.

A fan can increase airflow and help cool a stalled horse.

Radiation is a form of heat loss through infrared rays, involving the transfer of heat from one object to another, with no physical contact involved. A horse can lose heat to surfaces that are cooler than its hair coat surface by radiation. By the same token, providing shade for a horse can limit the amount of radiated heat the horse is exposed to from the sun.

Evaporation is the process of losing heat through the conversion of water to gas (evaporation of sweat). Evaporation of water through sweating (and to a much smaller degree through exhalation) is one of the greatest mechanisms a horse has to cool off in hot weather or during intense exercise. The horse has the capacity to regulate its rate of sweat in response to surrounding

temperatures and its activity level. Every gram of water removed from the surface of the skin through evaporative heat loss removes a great deal of heat from the body core (0.58 Kcal per gram of water). There is an indirect relationship between relative humidity level in the air and evaporative heat loss. The higher the relative humidity level, the lower the evaporative heat loss in the animal, so the horse can overheat faster when working in high humidity.

During hot weather, a horse may change its behavior, becoming less active and seeking out shade from the sun and biting insects. A horse's summer hair coat will be shorter and thinner than its winter hair coat. In addition, the summer coat will lie flat against the skin so that hot air is not trapped between the horse's skin surface and the hair. Finally, the vessels beneath the skin's surface will dilate so that body core heat can be released from a horse's body surface.

The following tips will help ensure your horse stays comfortable in hot weather.

- Provide horses with easy access to a shade source that has good ventilation. (Note: a horse needs about 80 square feet of floor space if sharing a shelter).
- Provide horses with constant access to clean fresh water.
- Since horses will have increased sweating activity, they should also have access to a trace mineral salt bock.
- A horse that is exercised in a hot climate may also benefit from salt added to the feed.
- A cold hosing can help the horse dissipate excess heat in extreme conditions.
- An older horse that has trouble shedding its winter coat should be body clipped to help it stay cool in the summer.

CLIMATE CONTROL

In livestock housing, the principle elements of the climate conditions that affect the horse are ambient temperature, moisture (relative humidity), ventilation rate (air changes per hour) and air movement.

Horses can do well in nearly any temperature if the humidity can be held to a comfortable level and there is enough air movement through the building to keep the air clean and free of condensation. The most detrimental conditions to the health of horses in a barn occur when a barn is cold and also has a high moisture level. These conditions can harm their respiratory systems and allow them to inhale harmful pathogens.

A three-sided shed fulfills the essentials of a shelter by providing good ventilation and protection from the elements as long as it is oriented correctly to take advantage of a cool breeze or protect horses from severe wind. An enclosed barn can be more problematic since you must build to insure proper ventilation. Very few horse barns are insulated, so any ventilation restriction causes undesirable conditions.

BUILDING ORIENTATION

If a new barn or housing shed is to be built on a site, building orientation is one of the most important aspects to consider. In placing the building, you want to locate the barn so that you can use the natural air flow to keep the barn comfortable in hot weather while protecting from drafts in the cold weather.

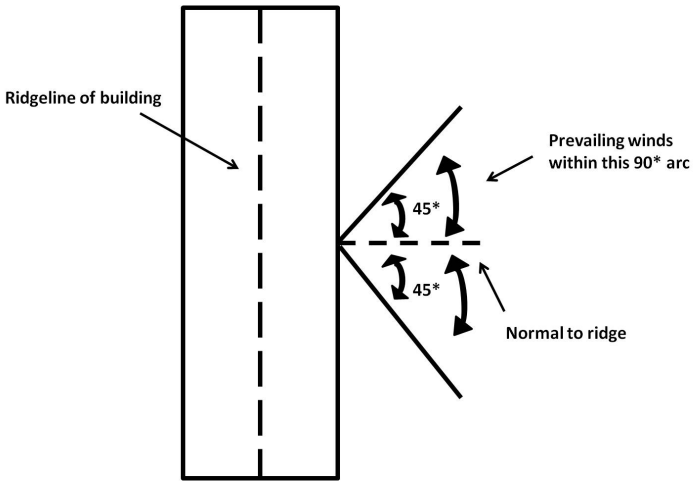
If stalls are placed on the south side of the barn, the stall windows will allow more heat to build up inside the stall on a sunny day. On the other hand, the same window placement allows more sun into the barn during colder months. Geographical and barn location, weather patterns, etc. need to be evaluated and addressed to get the best advantages for each individual situation.

The opening of a three-sided shed is usually placed opposite from the **prevailing winds** to protect horses from rain and ice storms in the winter.

Definition:

Prevailing winds: wind that blows predominantly from a general direction.

A barn's ventilation process works best if it is built in an area of unrestricted air flow so that the air can move over the top of the building, drawing out the warm moist air from the inside. Barns positioned in a low spot surrounded by other solid structures will have less access to a breeze.



A barn or shed should be oriented to take advantage of prevailing winds. Positioning a barn in an elevated area with the stall windows facing the prevailing winds can facilitate a cross breeze during the hot summer months.

ROOF VENTILATION: RIDGE VENT, OVERHANG AND SOFFIT

A new barn should have at least a 6-inch **ridge vent** with a minimum 12- to 14-inch **overhang** and a vented **soffit** running the full length. A vented soffit is a covering on the overhang of a barn which allows fresh air to enter into the barn. Commercial soffits are manufactured with holes; hardware cloth with up to one-quarter-inch openings can also be used. A rule of thumb is to provide at least 1-foot of ridge ventilation for each horse or stall in the barn. There should be at least 4 to 6 air changes per hour in an adequately ventilated barn.

Definitions:

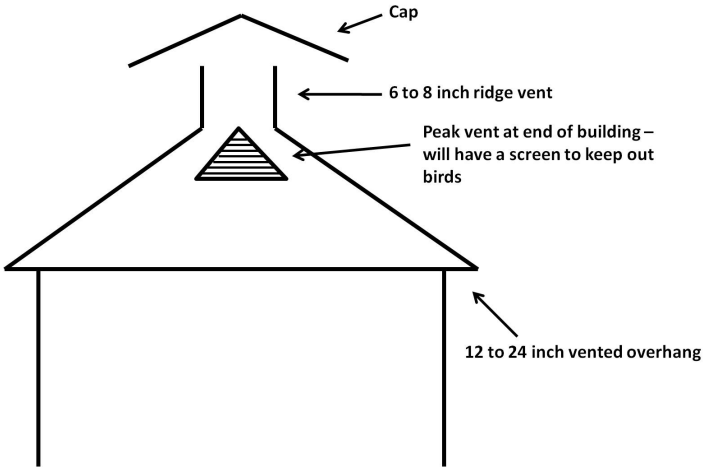
Ridge vent: runs length wise on the roof of the barn and should provide at least a 1 inch opening per 10 feet of barn width.

Overhang: the distance measured horizontally that a roof projects beyond a wall.

Soffit: the underside of a roof overhang.

Peak vent: ridge vents located along the peak of the roof that allows warm moist air to move up and out of a building.

Barn Ventilation Specification



The ridge should have a cap to keep out rain or snow

CONCLUSION

Horse housing should be built to optimize the health and well-being of the horses, not the creature comforts of people. Horses have a wider range of climate tolerance, especially in cold weather. Tightly enclosed barns might be warmer in the winter, for the horse owner, but may have poor ventilation resulting in increased respiratory problems in horses. Most horses need at least three to six hours of daily turnout time to promote skeletal strength and reduce undesirable behaviors associated with stalling (wood chewing, cribbing, weaving, head tossing). Providing shade during extreme heat and ensuring there is adequate air flow will help horses keep cool in extreme hot temperatures.

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For more information read MSU Extension bulletin E3161, "Behavioral Considerations When Housing Horses."

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