Heat Stress in Lamas

International Llama Association Educational Brochure # II

Introduction

The lama has become accepted as an easily cared-for, domesticated, investment animal in North America. Their low maintenance and affordable care, along with their exotic allure, has helped fuel their explosive growth in recent years. These animals evolved in the high altitudes of the South American Andes and are not naturally adapted to long periods of exposure to extreme heat and/or humidity. As a result of this, one of the more serious health problems which may be encountered in lama management is heat stress. Considering this, some special attention is required for lamas exposed to prolonged periods of hot weather.

The syndrome of heat stress in lamas can result in poor growth or performance, serious illness and possibly death. The purpose of this brochure is to help the lama owner understand the causes, recognize the signs, become familiar with treatment, and hopefully help prevent the occurrence and sequelae of heat stress in lamas.

Causes and Effects of Heat Stress on Lamas

Normal metabolic functions, i.e. breathing, walking, eating, digesting and assimilating nutrients, generate body heat. In order to prevent heat stress, the lama uses many mechanisms to dissipate excess heat. As the lama's body temperature begins to rise, it will shed this body heat into the surrounding air by vasodilation (or enlarging the blood vessels) with concurrent, increased blood flow to the skin and periphery of the body. This particularly occurs around the perineal area, between the legs, and on the ventral aspect of its abdomen or trunk. The lama may pant, warming and moisturizing the air as it breathes. This releases heat, cools the lungs and allows evaporation of fluid from the respiratory tract, thus cooling the body. Sweating is also another efficient cooling method the lama utilizes to control their body temperature.

These thermoregulatory mechanisms may begin to fail if the air around the lama becomes stagnant (e.g. non-windy days), if the ambient temperature approaches the lama's body temperature, and/or if the ambient humidity is high enough to decrease the effectiveness of evaporation. Lamas sweating or panting excessively can become dehydrated, with a resultant lowering of blood volume. This decreases the effectiveness of cooling by large blood vessels under the skin attempting to "dump" or unload excess body heat. Dehydration and resultant loss of body fluids results in an increased heart rate, which places even more demands on an already "taxed" system.

The lama's ability to respond to increased body heat is further reduced if the lama is exercised, bred, fights or worked during the hotter part of the day. Obesity further decreases the lama's ability to effectively deal with body heat on hot, humid days. A long, shaggy, poorly groomed fiber coat is a very effective thermal insulator and decreases the lama's ability to rid itself of excess heat and stay cool. Other lamas at increased risk for developing heat stress include lamas that may have impaired or poorly developed thermoregulatory responses such as very old, debilitated or sick lamas, and very young crias or late-term pregnant females and lamas with high-strung or nervous personalities.

Reproductive problems associated with episodes of heat stress include impaired spermatogenesis and infertility in the male. Females suffering from heat stress may experience early embryonic loss, abortion, or birth of premature or dysmature, weak crias. These dams may have less than optimal amounts of colostrum and milk production. Breeders should be aware that heat stress occurring in pregnant females, particularly during early gestation, may result in birth defects of the cria.

Detection of Heat Stress

The initial signs of heat stress may be quite subtle and apparent to only the most astute observer. The most common signs of heat stress may include panting, depression or dullness, anorexia or off feed, a rectal temperature of >104° F, a respiratory rate >40 per minute, and a heart rate >90 per minute. More obvious signs include drooping of the lower lip, excessive salivation, facial or partial facial paralysis, scrotal swelling or edema in the intact male, trembling, weakness, difficulty breathing, and abnormal behavior. Some depressed lamas will lay near water troughs or may defecate while in the cushed position.

As heat stress progresses, body systems begin to fail due to fatigue and loss of body fluids and electrolytes. The lama becomes unable to stand and very depressed. Occasionally, edema of the legs and chest will develop due to cardiovascular collapse and heart failure. When the rectal temperature reaches 105-108° F or greater, the lama may convulse. Without intervention, severe alterations of the lama's ability to maintain a safe body temperature will result in death.

It is of paramount importance that the lama caretaker be vigilant and know the normal behavior of an individual lama. Heat stress syndrome may begin with a lama simply not eating and depressed, and then rapidly progress to a complete collapse of all body systems with resultant death. The onset of this syndrome may be so insidious that careful observation of any alterations in the eating, drinking, and other behaviors of the lama is critical in the detection and early treatment of heat stress. One of the most common mistakes is to assume the depressed lama will be fine, and to delay close examination. Lamas that are not acting normally should be examined immediately. When heat stress is suspected, your veterinarian should be consulted in order to perform a complete physical examination for diagnosis of other diseases occurring along with, and possibly exacerbating, heat stress, e.g. pneumonia or parasitism.

Treatment

The intensity of treatment should be determined by the severity of the signs the lama is exhibiting. The most effective treatment in the early stages is simply cooling the lama down. This can be accomplished by hosing the lama down with a water hose, placing the lama in the shade or pond, in front of a fan or in an air conditioned room. Expeditious shearing of the chest and blanket area in an air conditioned room, without placing undue stress on the lama, may also be considered. If the lama has been wet down over wool or heavy fiber, it is imperative to ensure that thorough skin contact be made with the water and care should be taken to avoid wetting only the fiber. If an unshorn or ungroomed lama is sprayed or sprinkled with water to aid in cooling the wet fiber may form a "mat" with resultant heat retention.

Lamas who are lying down, depressed, unable to rise and in severe distress, may not only require cooling (e.g. water hosing, air conditioning) but may also require more stringent measures such as alcohol rubs, ice water enemas or water immersion. If cold or ice water enemas are used for cooling, it is important to note that the rectal core temperature may be inaccurate for up to six hours.

All dehydrated lamas should be allowed free access to fresh, clean, cool water. As they cool down and rest, many will begin to drink. Those lamas too depressed to drink or who are clinically dehydrated (<8%) should be given fluids by oro-gastric tube. Care should be taken when this is done, and if the owner-handler is not experienced in gastric intubation, it is best to enlist the aid of a practicing veterinarian before attempting to pass a stomach tube. Lamas that are clinically dehydrated (>8-10%) are best rehydrated with a balanced electrolyte solution intravenously as fluid given by oro-gastric tube will be poorly absorbed from the intestine.

Ancillary treatments which may be indicated include non-steroidal anti-inflammatory drugs (i.e. Banamine) for pregnant females and/or steroids (i.e. dexamethasone) for open females and males. Injectable B vitamins, which include thiamine, may be of value not only to improve appetite but also to aid in the prevention of an anticipated complication called polioencephalomalacia. The use of probiotics or transfaunation may be of value in anorectic lamas with depressed motility. In most cases where the Vitamin E or selenium status is questionable, lamas should be given supplemental Vitamin E and selenium by injection. If the diet has been fortified or if the lama's whole blood selenium concentration is normal, injectable selenium is contraindicated. Lamas recumbent and depressed will have a compromised immune system and broad spectrum antibiotics may be indicated to prevent pneumonia or other secondary infections. Again, a veterinarian should be consulted in all instances where invasive therapy is indicated. Above all, common sense should dictate all modes of treatment.

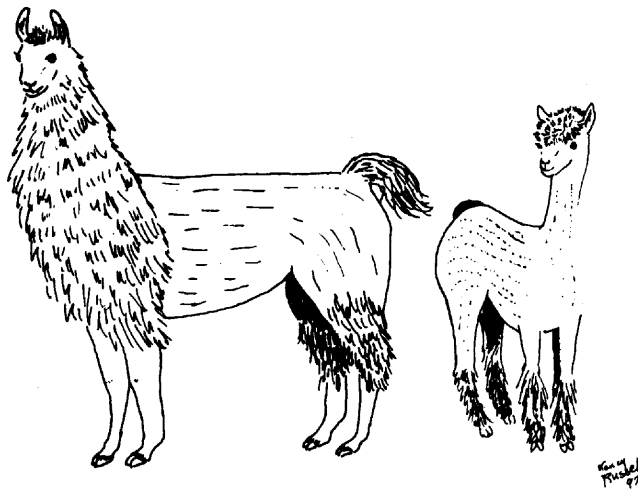
Good quality feed should be made available free choice, but close monitoring is needed to prevent grain overload. Lamas unable to stand should be massaged, rolled, floated in tubs or ponds, placed in a sling, and/or kept in heavily bedded stalls in order to prevent damage to muscles. In cases of mild heat stress, mild treatment may be all that is required, but in severe cases, intensive medical intervention will be warranted.

Prevention

Water

To prevent heat stress, preplanning is essential. Always provide plenty of fresh, cool, clean water as water requirements may double during periods of increased heat exposure. Water containers should be strategically placed in shaded areas. If during periods of increased risk, lamas are given palatable electrolyte mixtures in their water, another source of fresh, untreated water should be made available to ensure water intake for those lamas who dislike the taste of electrolytes. Because glucose and other solutes in most electrolyte mixtures favor bacterial growth, electrolyte containing solutions should be replaced and containers cleaned daily.

Shearing and Fiber Care



The lama's fiber should be clipped or sheared to 1-3 inches over the entire lama prior to periods of significant heat exposure to help prevent heat stress. If shearing is prohibitive due to sale or show, the fiber should be kept clean and well-groomed. Other innovative methods such as wrapping the tails, shearing the fiber around the perineal area and abdomen, or shearing the abdomen and up the neck will help expose these areas for better air movement and cooling. Another shearing pattern allows the sides to be clipped to the skin one-third to half way up the chest while the fiber from the upper chest is allowed to grow long and hang over the shaved region. In particularly hot climates, it may be beneficial to keep the ventral abdomen sheared throughout the "hot" season. Any of these shearing methods can be used to help maintain a presentable lama for sale and still allow for a greater exposed surface area for cooling.

Shade, Housing and Environment

Adequate shade and housing should be provided to lamas as an important measure in the prevention of heat stress. Shade trees are the best type of shade as they cool the area more effectively due to evaporation from the leaf surface. However, if shade trees are not available, non-permanent structures built of metal pipe and covered with woven polypropylene fabric, or "shade cloth", will provide 80% of the shade of solid roofed buildings. These structures are Inexpensive and may be moved from pasture to pasture, reducing construction costs. These are excellent alternatives for shadeless pastures.

Barns or permanent structures should have ceilings 12-14 feet high in order to provide sufficient air movement, and those structures 40 feet wide should be >14 feet high at the eaves. Hay stored in the loft of a barn provides good insulation, but unfortunately, prevents cooling of the barn. Barn roofs painted reflective colors may help keep the barn cooler. Whenever feasible, a "cool" or air conditioned room should be built into the barn where heat stressed lamas can be taken and treated. High efficiency fans or evaporative coolers are of great value and can be installed in barns in order to provide plenty of air movement, preferably pulling air from shaded or cooled areas. There is no need to blow hot air around.

Sprinklers can be effective, particularly if they are used to spray and cool the ventral area or abdomen of the lama. If foggers or misters are used, they may cool the immediate environment around the lama, but their effectiveness is diminished on windy days. Also, foggers and misters must be maintained and cleaned properly on a regular basis as respiratory diseases in lamas have been associated with these methods of cooling. Wading pools such as a child's swimming pool can be beneficial to cool lamas, but many lamas will require training and time to become accustomed to pools. Sand boxes placed in the shade and kept moist can provide a place for lamas to lounge around in and stay cool. Unfortunately, both swimming pools and sand boxes will need frequent cleaning and their frequent use may result in rotting or loss of body and leg wool.

Nutrition

Proper nutrition and dietary control play a key role in the prevention of heat stress. Ensure a well balanced diet with adequate selenium, but avoid the overfeeding of protein. The feeding of excessive protein (>7-8% of the diet) will result in increased energy waste, digestion and use of protein for energy, and excessive water loss (increased urinary excretion of excess urea from protein metabolism). Diets high in poor quality roughage, although probably suitable for some lama operations, give off excess heat during digestion, and therefore should be avoided during times of increased risk of heat stress.

Energy requirements of lamas may actually be increased by panting and increased heart rates associated with attempts by the body to maintain temperature in a safe range. Unfortunately, with decreased feed intake, which is commonly associated with heat stress, the intake of nutrients is also diminished. Intake of grain or concentrates may help alleviate this energy deficit produced by increased demands and reduced intake. If grains are increased as a portion of the diet, care should be exercised to make such dietary changes slowly.

During hotter weather, the rate of passage of ingesta through the gut tends to be slower than normal, therefore, signs of colic should be watched for, as impaction may occur. Also, with the association of altered thermoregulatory ability resulting from feeding endophyte infected fescue in other species, the lama owner should consider limiting its use in lamas during times of potential heat stress.

Herd Management

Husbandry practices should be modified during periods conducive to heat stress. If at all possible, breeding, birthing and weaning should be done during the cooler times of the year. This modification of the breeding season will prevent parturition during hot periods of the year, as crias and late-pregnant lamas are very susceptible to heat stress. If breeding is unavoidable during the summer months, it should be performed during the coolest part of the day or evening. Prior to periods where excessively high ambient temperatures and/or humidity have historically occurred, the lamas should be vaccinated, dewormed, body condition scored, and weighed.

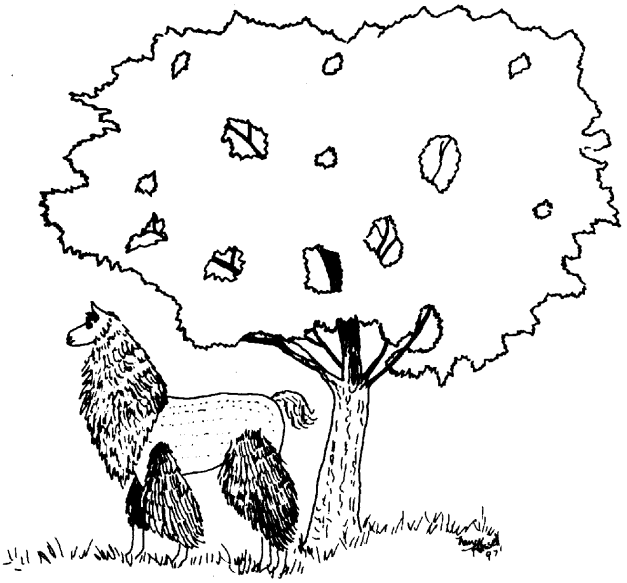
Lamas should be kept healthy, trim and fit to avoid heat related problems associated with obesity. Body weight should be recorded and monitored for excessive weight loss or gain. The most commonly used body score system uses a 1 to 10 score, where 1 is very thin and 10 is extremely obese. A body score of 5 is an ideal body condition score.

Body condition of lamas is best assessed by palpating the transverse processes of the lumbar vertebrae (loin region), areas around the shoulder and over the ribs. If the ribs are easily palpated, the score is usually <5. If the ribs are difficult to feel and if the loin is bulging and slightly soft, the lama is scored >6. The lateral aspects of the transverse

processes of the lumbar vertebrae should not be sharp, but easily palpable. The shoulder should also be palpable with the bones and joint edges not sharp, but appearing to have a slight smoothness. As lamas gain weight, they begin to lay down fat on the brisket, between the rear legs, and around the perineum. The pelvic bones can be easily felt in lamas and one should avoid making condition decisions based on palpating dorsal to the pelvic region (hip area).

An accurate set of scales is also very useful in aiding the lama owner in herd dietary management. Lamas naturally gain weight in spring and early summer and tend to lose weight in late summer, fall and winter. If lamas are weighed at sixty day intervals, those adults who do not show this seasonal pattern, but continue to gain weight should be monitored and steps taken to prevent continual and possibly slow body weight changes which are difficult to observe on a day-to-day basis. Body weights should be evaluated at least on an annual basis.

Avoid moving lamas to a warmer climate, i.e. north to south, during the summer months. It may take 6-8 months to acclimate lamas to a new geographical area, feeding practices and herdmates. Avoid regrouping lamas during the summer to avoid fighting. The herd manager should carefully watch and count the respiratory rate of undisturbed lamas. If the average respiratory rate of the majority of the lamas is >40 breaths per minute. more preventive measures should be instituted. Lamas with nervous personalities should be closely monitored.



A guideline which may be useful to help determine if lamas are at risk is to add together the ambient humidity and temperature (°F). If this number is 120 or less, only minimal risk exists. If the number is 150 or more, as many precautions as are available should be implemented. As the number approaches or exceeds 180, extreme caution should be exercised, as lamas are at great risk for developing heat stress. In areas of the country where humidity is consistently low, or plays only a minor role in the cause of this syndrome, this formula may not be valid.

Lamas can and have been successfully raised in all inhabited areas of the U.S.A., from the Florida Keys and Southern California to Maine and Alaska. In areas prone to heat stress, special attention should be paid to quickly identifying affected lamas, followed by prompt and effective treatment protocols. However, prevention should be the mainstay of any lama breeder's health program, particularly where heat stress poses a significant health risk to lamas.

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