



## Anhidrosis in a horse - case report

Anidrose em equino – relato de caso

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**ABSTRACT:** Equine anhidrosis is the inability of the animal to sweat appropriately upon stimuli, which may lead to serious heat stress problems and consequent reproductive problems such as testicular degeneration. Anhidrosis has a high prevalence in animals kept in hot and humid environments and its pathogenesis may be related to a progressive failure in the secretory process, glandular degeneration or reduction in the responses of the glands in contact with adrenaline. The disorder can be considered partial or complete, and the main clinical signs are those related to heat stress such as hyperthermia, tachypnoea, apathy, lethargy, anorexia and dermatological problems. The diagnosis is made using semi-quantitative intradermal adrenaline or  $\beta_2$  agonist tests. The management of this condition should mainly involve removing the animal from the stress-inducing environment.

**Keywords:** degeneration; heat stress; hyperthermia; sudoresis.

**RESUMO:** Anidrose equina é a incapacidade do animal desenvolver sudorese apropriada mediante a estímulos, podendo levar a sérios problemas de estresse térmico e consequentes problemas reprodutivos como a degeneração testicular. A anidrose tem prevalência elevada em animais mantidos em ambientes quentes e úmidos e sua patogenia pode estar relacionada com falha progressiva no processo secretor, degeneração glandular ou redução das respostas das glândulas em contato com adrenalina. A enfermidade pode ser considerada parcial ou completa, e os principais sinais clínicos são aqueles relacionados ao estresse térmico como hipertermia, taquipneia, apatia, letargia, anorexia e problemas dermatológicos. O diagnóstico é realizado por meio de testes semiquantitativos de adrenalina ou  $\beta_2$  agonista intradérmicos. O manejo dessa enfermidade deve ser principalmente a retirada do animal do ambiente causador de estresse.

**Palavras-chave:** degeneração; estresse térmico; hipertermia; sudorese.

## INTRODUCTION

Equine anhidrosis or dry coat is defined as inefficient sweating in horses when faced with appropriate stimuli. It occurs mainly in hot and humid climates and is not predisposed by breed, coat or age (Hubert; Beadle; Norwood, 2002). Thermoregulation is the result of complex biological processes, which are influenced by environmental factors such as wind speed, precipitation, humidity and solar radiation, which, combined with the action of the thermoregulatory system, will determine the magnitude of body temperature (Sjaastad; Sand; Hove, 2016).

Horses at rest maintain thermal regulation using mainly skin evaporation mechanisms, but during exercise they dissipate heat mainly through two mechanisms: via the respiratory tract, which corresponds to an average of 23%, and almost 70% via dispersion through sudoresis, and this mechanism is influenced by humidity and temperature (Hodgson; Davis; Mcconaghy, 1994). Hot and humid environments increase heat accumulation, making it difficult to dissipate (Brownlow; Smith, 2021).

Horses affected by anhidrosis show reduced or complete absence of sudoresis, increased body temperature, tachypnoea and dilated nostrils even at

rest, increased pulse, abnormal murmur and skin problems, all of which are important signs for diagnosis (Jenkinson; Elder; Bovell, 2007). The conclusive test is carried out through subsequent intradermal adrenaline injections (Evans, 1966). Sweating reaction induced by local application of  $\beta_2$  agonists, including terbutaline sulphate and salbutamol, can be used to identify complete or partial anhidrosis (Jenkinson; Montgomery; Elder, 1985).

Once diagnosed, there are no proven treatments to improve the condition, so it is recommended that the animal be moved to a different environment. It is crucial to have favourable climatic conditions with milder temperatures in the stalls through the installation of fans and cooling during the hottest periods with cold water baths (Takahashi; Takahashi, 2020).

The purpose of this paper is to report a case of partial anhidrosis in an equine and to describe the clinical condition resulting from heat stress.

## CASE REPORT

A 6-year-old quarter horse, male, vaquejada athlete, weighing 440kg, was attended at the Large Animal Clinic - University Veterinary Hospital - UFPI, with a

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complaint of a scrotal wound (Figure 1) that had been present for more than 90 days, without success in the treatment based on healing ointments, antibiotic therapy and anti-inflammatory drugs. On physical examination, skin lesions suggestive of dermatophytosis were observed, mainly in the region of the croup and limbs. During the evaluation, it was observed that the left scrotum was enlarged and presented a circular wound measuring 2 cm and the testicle had a flaccid consistency. The right scrotum displayed a rounded, well-defined wound with raised borders, measuring around 9 cm, and the testicle presented a similar consistency to the left one (Figure 1).

**Figure 1** – Enlarged left testicle and 2 cm wound. Right testicle of a Quarter Horse with a rounded, well-defined wound, with raised borders, measuring an average of 9 cm.



Source: Collection of the author.

The animal exhibited altered vital parameters: tachycardia (80bpm) and significant arrhythmias, respiratory rate 30 bpm with no changes on pulmonary auscultation, hyperthermia (40°C), normocoloured mucous membranes and normal capillary refill of 2.5 seconds.

In the daily evaluations, the animal at rest always presented tachypnoea and hyperthermia, with an increase in temperature according to variations in ambient temperature, plus transient cardiac arrhythmias. A haemogram, fibrinogen and biochemical profile were carried out, which showed no significant changes. Analyses of the hormones T3 (45.00 ng/dL), T4 (1.81 mcg/dL) and TSH (0.05 ng/mL) were requested, which were within the reference range. In light of the clinical signs (tachypnoea, desquamative lesions, hyperthermia) and the climatic profile of the region, with its relatively high temperature and humidity, it was assumed that the condition was suggestive of anhidrosis.

Based on the clinical suspicion, the response of the animal at peaks of higher body temperature to intravenous (IV) administration of dipyrone 20 mg/Kg was evaluated to assess the patient's response in order to rule out the possibility of fever. Therefore, the temperature was measured every 15 minutes after application, and there was no success in the therapy, as the animal's temperature remained above 39°C.

In order to relate body temperature to the environment, the rectal temperature of the animal was evaluated in relation to the local temperature and humidity (Graph 1).

To evaluate the degree of sudoresis, in accordance with Evans (1966), subsequent applications

of adrenaline hydrochloride were made in four dilutions, 10-3, 10-4, 10-5 and 10-6, in specific points on the ribs and along the neck. The site was trichotomized and prepared for the intradermal application of 0.1 mL of the duly diluted solution (Figure 2).

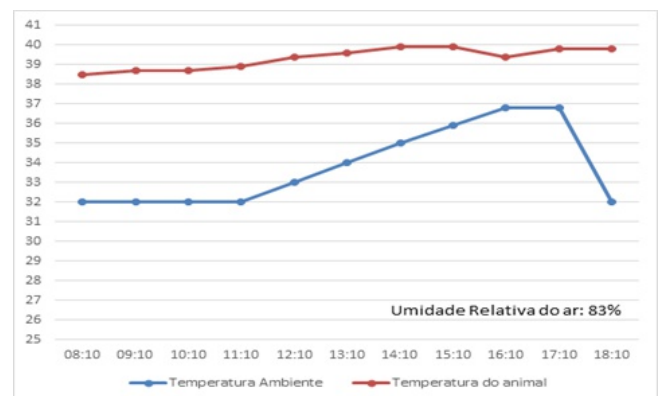
Approximately 30 minutes after application, sweating was observed in the neck region at the points where the 10-3, 10-4 dilutions were administered. However, in the region of the ribs there was little reaction, only small droplets of sweat about an hour after the application at all concentrations (Figure 3).

The animal was observed for two hours after the application of adrenaline, with no change in the



quantity of sudoresis. At the time of the intradermal test, the ambient temperature was 26°C, with humidity of around 83%, according to the Centre for Weather Forecasting and Climate Studies of the National Space Research Institute. The animal maintained a rectal temperature within normal parameters of 38°C.

**Graph 1** – Relationship between environmental temperature and patient temperature.

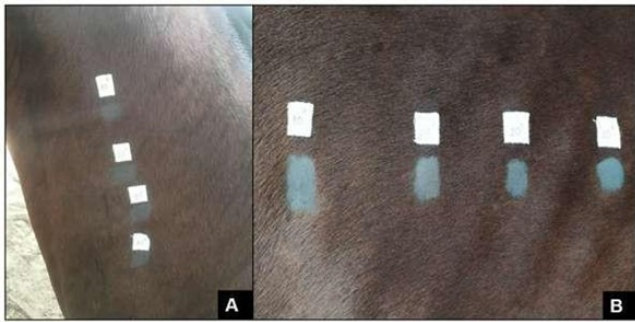


Source: Instituto Nacional de meteorologia- Relative Humidity: 83% / Ambient Temperature / Temperature of the animal.

On the basis of the response to the test, the horse was diagnosed with partial anhidrosis, and was not classified as complete since it showed a reaction to adrenaline, especially in the neck region, although it was discreet.

The treatment instituted was to keep the animal in a cool, ventilated place, especially during the times when the temperature was highest, with frequent

**Figure 2** – A. Four-point trichotomy in the rib region to diagnose anhidrosis in an equine. B. Four-point trichotomy in the neck region for the diagnosis of anhidrosis in an equine.



Source: Collection of the author.

**Figure 3** – A. Sudoresis in the neck region on average 30 minutes after application, considerable at dilutions 10-3, 10-4. B. Reaction after application of adrenaline not very evident.



Source: Collection of the author.

baths in cold water and physical activity only during the coldest periods. As a result of these changes, there was a reduction in tachypnoea episodes. An andrological examination was also recommended for the investigation of testicular alterations (Table 1).

Two semen collections were made with a 30-minute interval between them, the first time the sperm jet had a watery appearance and the second one was slightly milky. The andrological examination revealed the low reproductive efficiency of the animal compared to the reference values, and recommended clinical treatment of the condition and a new andrological assessment at a later date. In view of the slow progress in the treatment of the scrotal lesion, the owner opted for an orchiectomy.

## DISCUSSION

Anhidrosis is a common condition in hot and humid environments, as in the region where the animal was, and is related to the inability or inefficiency of the animal to sweat (Johnson; Mackay; Hernandez, 2010). Since the animal cannot perspire adequately, it disperses heat via respiratory evaporation so that it can disperse more heat and compensate for inefficient sudoresis, and needs to increase respiratory rate and depth, thus manifesting one of the main signs of anhidrosis and heat stress, which is tachypnoea (Sullivan *et al.*, 2015). This condition was also reported by Hubert, Beadle and Norwood (2002) when they assessed an animal affected by anhidrosis with frequent

tachypnoea, always above 60mrpm, and dilated nostrils even when at rest.

In cases of chronic anhidrosis, skin lesions, dryness of the epidermis, areas of desquamation and alopecia are common, signs that were also found in the animal in question. Other possible findings are lethargy, anorexia and reduced water consumption, the latter being observed in the patient (Hubert; Beadle; Norwood, 2002).

According to Alvarenga and Papa (2009) signs of reproductive alteration such as testicular degeneration have been reported in animals that do not thermoregulate efficiently and several studies have induced testicular insulation in bovines and stallions, have shown that a few hours of altered thermoregulation are enough to compromise spermatogenesis and lead to testicular degeneration through a mechanism of hypoxia and tissue death. Therefore, whenever the body temperature rises, there is a risk of testicular damage. The pathophysiological mechanism of anhidrosis is not yet well defined, but it may be related to a decreased response from the sudoriferous glands of the skin or a lack of response to an appropriate stimulus. Potential causes have been described, such as electrolyte imbalances, hypothyroidism, sudoriferous gland exhaustion, obstruction or blockage of the ducts of the sudoriferous glands, failure of the secretory function and negative regulation of the sensitivity of the glands (Hubert; Beadle; Norwood, 2002). In this horse, there was no change in thyroid hormones, results that coincide with the findings of Breuhaus (2009) whose studies showed that anhidrotic horses and normal horses from hot and humid climates had normal hormone levels.

The test of choice for the definitive diagnosis of the disorder consisted of subsequent applications of intradermal adrenaline using various dilutions (10-3, 10-4, 10-5 and 10-6) with a volume of 0.1 ml, as reported by Evans (1966). Some animals may have sweat remaining under the mane, saddle, halter areas and in the axillary, inguinal and perineal regions (Warner; Mayhew, 1983). On the animal in question, sweat residue was observed under the mane. In this case there was a moderate response, corroborating the studies of Evans (1966), taking into account that the animal was at rest, away from sporting activities and in a different region from the beginning of the study, and may be related to a change in handling, which is described as the best form of treatment (Hubert; Beadle; Norwood, 2002).

## CONCLUSIONS

Anhidrosis is an important medical condition that causes heat stress, especially in animals kept in hot and humid climates, causing major losses in equine farming due to a reduction in sporting performance. The diagnosis, which is sometimes not elucidated and ends up being neglected, is essential for animal welfare, since the thermal management of the patient must be differentiated.

In addition to the decline in performance that has already been widely discussed in the literature, this report also draws attention to the damage to the reproductive life of the animal, taking into account that hyperthermia can lead to testicular degeneration. As this subject has a limited bibliography, there is a need for more in-depth studies.



**Table 1** – Clinical examination and spermogram of a horse attended with suspected anhidrosis.

Prepuce: No alterations		Penis: No alterations	
Testicles			
	Right	Left	
<b>Dimensions (Length x Width x Height)</b>	8.9 x 4.3 x 8.2 cm	10.5 x 5.4 x 8.6 cm	
<b>Symmetry</b>	Symmetrical	Asymmetrical	
<b>Form</b>	Ovoid	Ovoid	
<b>Position</b>	Normal	Abnormal	
<b>Consistency</b>	2	3	
<b>Sensitivity</b>	Altered	Altered	
<b>Mobility</b>	Normal	Altered	
<b>Epididymis</b>	Unaltered	Unaltered	
<b>Internal Genitalia:</b> Not evaluated			
<b>Sexual behaviour (libido):</b> Excellent			
Spermogram			
<b>Collection Method:</b> Artificial Vagina		<b>Date:</b> 05/12/2020	<b>Time:</b> 08:10
<b>Characteristics of the Ejaculate</b>	<b>Volume:</b> 22.5 mL	<b>Colour:</b> Greyish-white	<b>Aspect:</b> Aqueous
	<b>Motility:</b> 30%	<b>Vigour:</b> 2	<b>Concentration:</b> 120x10 <sup>6</sup> spz/mL
<b>Spermatic Pathologies</b>	<b>Minor Defects:</b> 9%	<b>Major Defects:</b> 5.5%	<b>Total Defects:</b> 14.5%

Source: Collection of the author.

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