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Epidemiology, electrolytes balance and treatment strategy of equine anhidrosis

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Abstract

This research work was designed to study the prevalence, electrolytes balance and treatment strategy of equine anhidrosis in Faisalabad, Pakistan. The study was conducted in the hottest month of summer (June-September). Anhidrosis was diagnosed by clinical signs and subsequent intra- dermal adrenaline and salbutamol injections. Overall prevalence of anhidrosis in horses was 13.2% of the total tested horses. Prevalence of anhidrosis was high during months of July and August. Further, it was observed that 6 12 years old horses are more susceptible to this syndrome. Serum analysis showed that sodium and chloride were significantly low and potassium concentration was significantly high in anhidrotic horses. Diseased horses showed positive response to the treatment of iodinated casein and germinated wheat and the clinical signs disappeared gradually. It was concluded from this study that horses are vulnerable to the attack of anhidrosis during warmer months of summer affecting serum electrolytes profile. Further, iodinated casein and germinated wheat have excellent therapeutic potential against this syndrome.

Keywords: Anhidrosis; Horses; Minerals; Treatment

Introduction

Horses that lack the ability to produce sweat in normal quantities have a condition known as anhidrosis. Such animals are sometimes called nonsweater or dry coat horses. Common clinical signs in equine anhidrosis include high respiratory rate, increased body temperature, decreased tolerance to exercise, dry and dull hair coat with alopecia especially around the face and shoulder (Mayhew et al., 1987; Warner and Mayhew, 1982; Bashir and Raesedee, 2009). High environmental ambient temperature and humidity limit heat loss through evaporation which results in thermal stress (Warner and Mayhew, 1982). As heat is accumulated due to inefficient loss of heat, it results in elevated body temperature, increased heart and respiratory rates (Bashir et al., 2009). In one study, Lindinger et al (2000) found that fluid and electrolytes balance is disturbed under hot and humid conditions in exercised induced anhidrotic horses. On the other hand Maqsood (1956) reported that iodinated casein affectively ameliorates the anhidrotic condition and the horses begin to sweat again.

In our country, equines are still on of the principal means of transporting goods and people. Tens of thousands of people in Pakistan earn their livelihoods by using equines for various purposes. The lives of these horses have often been plagued by miserable and poor conditions as equines in our country belong to poor families, which cannot afford their proper well being. In Pakistan, summer is extremely dangerous for horses. Further their owners lack awareness about the hazards of heat stress and anhidrosis. In such conditions, anhidrosis is a natural consequence as horses are unable to cope with sizzling heat and added burden of high work load. There is paucity of research on various aspects of anhidrosis in horses in Pakistan. Therefore, this research work was conducted to investigate on epidemiology, electrolytes balance and response to treatment regime in anhidrotic horses in Faisalabad, Pakistan.

Materials and Methods

The study was conducted at outdoor Clinic of Veterinary Medical Teaching Hospital, Department of

Clinical Medicine and Surgery, University of Agriculture, Faisalabad, Pakistan in the summer months (June September) of year, 2004. The study was conducted on clinico-epedemiology, electrolytes profile and physiological response to therapeutic agents by anhidrotic horses. Total 151 horses were tested for anhidrosis. Diagnosis of anhidrosis was determined by the methods described by Lovatt (1996) and Guthrie et al. (1992). Briefly, intradermal injection of 0.5 mL of 10-3 w/v adrenaline was injected to each horse received at the clinic. Then Salbutamol (0.1 mL of 10-7 concentration of Salbutamol Sulphate) was also injected intradermally at interval of one hour and responses to sweating in both the cases were recorded. The history of work load was obtained from the horse owners. Heart rate, rectal temperature, respiration rate coat texture were also recorded for each horse examined. Meteorological data including maximum and minimum temperature and relative humidity during the study was obtained from Department of Crop Physiology, University of Agriculture, Faisalabad, Pakistan.

For determination of serum electrolytes, 5 mL blood from each anhidrotic horse was obtained in a sterile needle by puncturing jugular vein. Blood samples from control horses were also obtained at the same clinic. Serum was separated from the blood by centrifugation at 2500 rpm for 15 minutes. Serum was kept at 20°C till further analysis. Sodium and potassium were determined with the help of flame photometer by the method described by Wolf (1982). Bicarbonate concentration was determined by commercially available (Randox Laboratories, Ireland) kit. The method provided with the kit was used for determination of bicarbonate. Chloride was determined with the kit method (Chloride determination kit, DMA Inc., Texas, USA), according to the manufacturer's instruction.

The anhidrotic horses were housed in cold airy rooms in the premises of the clinic. They were provided plenty fresh cold drinking water. For therapeutic evaluation, iodinated casein was administered to anhidrotic horses according to the method described by Maqsood (1956). For comparison of therapeutic efficacy of casein, germinated wheat was given orally to the affected horses according to the instructions described by Shamoon-ur-Rashid (1997).

Statistical analysis

Date obtained was spread on excel sheet of personal computer. Month-wise prevalence was analysed by using chi-square test. Student's t-test was applied on data to compare electrolytes between normal and anhidrotic horses. Physiological response to treatment regime was analysed using ANOVA (Steel et al., 1997).

Results

Twenty out of 151 horses were found suffered from anhidrosis. Thus the overall prevalence was 13.2%. High prevalence was found in the months of July and August (30%), followed by September (25%) and lowest in the month of June (15%) as shown in fig. 1.

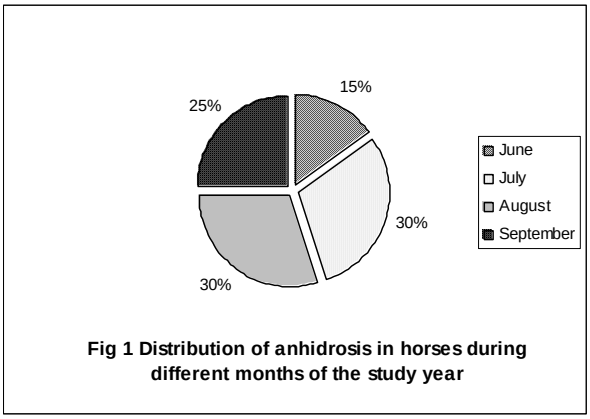

Fig 1 Distribution of anhidrosis in horses during different months of the study year

Prevalence of anhidrotic horses categorised by age group is given in table 1. No significant difference ($p > 0.05$) was found in different age groups.

Table 1: Distribution of anhidrosis in horses by their age groups

Age (years)	Total horses examined	Anhidrotic horses	Prevalence (%)	p-value
1 5	49	7	14.2	0.455
6 12	64	10	15.6	
13 18	38	3	7.8	
Total	151	20	13.24	

Prevalence of anhidrotic horses categorised by age group is given in table 1. No significant difference ($p > 0.05$) was found in different age groups.

Table 2: Mean ± SE of serum electrolytes between anhidrotic and normal horses

Variable (mEq/L)	Normal horses	Anhidrotic horses
Na^+	136 ± 0.267^a	117 ± 0.428^b
K^+	3.74 ± 0.01^b	3.94 ± 0.006^a
Cl^-	99.7 ± 0.534^a	83.3 ± 0.24^b
HCO_3^{-1}	26.5 ± 0.383	24.2 ± 0.32

Different superscripts in a row differ significantly ($p < 0.05$).

Sodium and chloride concentration were significantly low in anhidrotic horses. Significantly high concentration of potassium was found in anhidrotic horses. There was no significant difference of bicarbonate ion between normal and anhidrotic horses (table 2).

Table 3: Treatment effect of iodinated casein on different clinical signs of anhidrotic horses

Variable	Days		
	Day 1	Day 7	Day 14
Rectal temperature	105±0.86[a]	102±0.23[b]	102±0.7[b]
Pulse rate	81±2.32[a]	59.6±1.43[b]	53±1.12[b]
Respiration rate	95±3.55[a]	45.2±1.98[b]	47.3±1.91[b]
Adrenaline sweating time	12.9±0.56	10±0.43	11.1±1.01
Salbutamol sweating time	20±1.12[a]	15±0.98[b]	16.3±0.81[b]

Different superscripts in a row differ significantly ($p < 0.05$)

Table 4: Treatment effect of germinated wheat on different clinical signs of anhidrotic horses

Variable	Days		
	Day1	Day 7	Day 14
Rectal temperature	104.5±0.32	101.6±0.43	102±0.98
Pulse rate	78±1.49[a]	52±2.43[b]	48±2.87[b]
Respiration rate	95±2.33[a]	44±1.90[b]	42±1.65[b]
Adrenaline sweating time	12±0.76[a]	8.9±0.98[b]	8.7±1.00[b]
Salbutamol sweating time	19±0.98[a]	13.9±0.78[b]	13±0.45[b]

Different superscripts in a row differ significantly ($p < 0.05$)

Treatment effects of iodinated casein on different clinical signs of anhidrotic horses are given in table 3. It is evident that treatment of iodinated casein decreased rectal temperature, pulse rate and respiration rate significantly at day 7 and 14. Adrenaline and salbutamol sweating times also decreased in diseased horses gradually after treatment.

The treatment effect of germinated wheat on different clinical signs showed that pulse, respiration rate, adrenaline and salbutamol sweating time were significantly low at day 7 and 14 of germinated wheat treatment (table 4). Adrenaline and salbutamol sweating times also decreased significantly ($p < 0.05$) in diseased horses gradually after treatment.

Discussion

Local studies on the epidemiological aspect of different diseases which affect livestock especially equines are extremely sparse. Therefore, investigations are imperative for resource allocation as well as to minimize the economic effects of these diseases. In the realm of equine medicine, anhidrosis is a particular common disorder seen in hot, humid environment irrespective of the region. The pathogenesis of anhidrosis is not well understood, however, inability of the sweet gland to respond to adrenaline, breakdown of sweat gland, equaporin impairment, atrophy and hyperkeratinization of sweat gland ducts are some of the important causes of anhidrosis Bashir and Raesedee, 2009; Warmer and Mayhew, 1982; Bovell et al., 2006; Jenkinson et al., 2007).

In our study we observed that prevalence of anhidrosis increased from June to July. It was maintained in August and then decreased in September. The fluctuation of anhidrosis seems to be temperature dependant. In fact, in Faisalabad, the temperature increases from the month of June till August and then gradually decreases in September. Radostitis et al. (2000) reported that anhidrosis occurs most commonly in horses in countries with hot and humid climates including India, Indonesia, Srilanka, Malaysia, Australia and Gulf of Mexico Coast in the United States. Such results were also found by Warner and Mayhew (1982) who reported that anhidrosis is a common disease of horses found in hot and humid environment. In the current study, prevalence of anhidrosis was high in 6 12 years old horses. Our results are in agreement with that of Warner and Mayhew (1982) who concluded that age has significant effect on prevalence of this syndrome.

Horses can maintain homeothermy despite sever summer heat stress. In the current study, sodium and chloride concentration decreased significantly while potassium level significantly increased in anhidrotic horses. Our results are in agreement with those of Li et al. (2006) who found that sodium and chloride concentration decreased significantly and potassium increase in 6 12 years old training horses in endurance competition. The significant decrease in serum sodium and chloride has been attributed to their loss in sweat. On the other hand, the significant increase in serum potassium concentration in horses subjected to strenuous exercise in hot weather is probably due to release of potassium from the exercising muscles (Mckeever et al., 1993). We found no significant difference of bicarbonate concentration in normal and anhidrotic horses. Rose et al. (1980) found that bicarbonate level of plasma increases slightly at the midpoint of an endurance exercise but show no overall change.

Hyperthyroidism has been suggested as one of the causes of anhidrosis, because treatment with iodinated casein has been reported to ameliorate clinical signs. In this study, the anhidrotic horses were brought in cool, airy environment with plenty drinking water. Treatment of casein had desirable effects on different physiological parameters on day 7 and improved the condition on day 14. Maqsood reported that administration of daily dose of 10 15 gm of iodinated casein for a period of about 4 8 days cure the affected animals and again start to sweat.

It has been claimed that treatment with vitamin E improves condition and restore sweating (Mayhew et al., 1987. In this trial we treated anhidrotic horses with germinated wheat. Study on use of germinated wheat as a tool for treatment of anhidrosis is scarce. Young et al. (2001) found that dry wheat grains had no vitamin E. However, upon germination, the concentration of vitamin E steadily increased with increasing germination. Therefore, the germinated wheat may be used as a source of vitamin E to treat the anhidrotic horses. Recently, Shamoon-ur-Rashid (1997) reported 73% efficacy of vitamin E at the dose rate of 2000 I.U. in the equine anhidrosis treatment.

Therefore, it is concluded from this study that horses exposed to high temperature in hot and humid months in the summer are at the risk of anhidrosis altering electrolytes profile. However, the clinical signs disappeared when diseased horses were subjected to treatment of iodinated casein and vitamin E for a definite period of time.

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