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Prevalence of Anhidrosis in Thoroughbred Racehorses in Korea

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ABSTRACT

The primary means of heat dissipation in horse results from the evaporation of sweat. Anhidrosis refers to a decreased ability or loss of ability to sweat in response to appropriate stimuli. This disease is fatal and causes poor performance, increased body temperature, collapse, convulsion and even death. There are some reports about this disease abroad but not in Korea. We performed intradermal epinephrine test to investigate the prevalence of anhidrosis in Thoroughbred racehorses (n=50). The prevalence was 22% and it was similar to that of other countries. There does not appear to be sex, foaling country, coat color, age or pedigree of dam predispositions. In this study, we found the presence of anhidrosis in Korea. Anhidrosis should be prevented for economical purposes and general animal welfare.

(**Key words :** Anhidrosis, Korea, Prevalence, Thoroughbred racehorse)

Equine anhidrosis, dry coat, and nonsweating are all terms used to describe the disease in horses characterized by the inability to sweat effectively in response to appropriate stimuli. Although the epidemiology and clinical signs of the disease have largely been elucidated, anhidrosis is still widely prevalent, and methods of prevention and treatment are being sought (Hubert et al., 2002).

The physiologic mechanisms of sweating in horses are complex and still not completely understood (Higgins et al., 2006). Two major factors control sweating in horses are peripheral blood flow and concentration of circulating epinephrine. Peripheral blood flow, rather than cutaneous congestion, promotes sweating by exposing the sweat glands to circulating epinephrine (Colahan et al., 1999).

The pathophysiological mechanisms underlying anhidrosis are not known. The most plausible cause is altered sweat gland receptor function. It is thought that overstimulation of sweat gland β_2 receptors results in diminished function via desensitization or down regulation of the receptors (Hinchcliff et al., 2004). Anhidrosis was originally assumed to be associated with acclimatization to stress (Hubert et al., 2002), but a survey conducted in Florida in 1982 showed that more natives horses were affected than imported horses (Warner and Mayhew, 1982). Affected horses are unable to sweat normally, resulting in heat intolerance and possibly reduced exercise capacity, particularly during exercise that lasts more than a few minutes. Following exercise, horses show excessive elevations in rectal temperature and respiratory rate. Fatigue, depression, anorexia, and weight loss also may occur. The skin may be affected, becoming dry and flaky, and alopecia may occur, particularly on the face (Hodgson et al., 1994). In acute cases, sweating is much reduced or absent; this is accompanied by respiratory distress, labored breathing, fever, collapse and occasionally death (McCutcheon et al., 1998). Performance decreases as the disease becomes more severe (Colahan et al., 1999). Sweating rates produced in response to an exercise-induced thermal load can be further increased by high ambient temperature or humidity, which reduces evaporative efficiency, thereby contributing to the rate of rise in core body temperature (McCutcheon et al., 1998). Horses maintained in hot, humid climates are at risk, and exercise magnifies this risk (Brown and Bertone, 2002). Sound environmental management will continue to be a very important aspect inthe treatment of horses affected with anhidrosis (Hubert et al., 2002). There is a dearth of information on equine anhidrosis in Korea. This research focuses on the prevalence of anhidrosis in Thoroughbred racehorses in Korea in order to prevent expected accidents during racing or training, and to provide an appropriate training method from an animal welfare perspective.

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The experiment was conducted using fifty randomly selected domestic and foreign Thoroughbred racehorses (3 to 8 of age, 420 to 544 kg) at Busan Race Park in Korea. Diagnosis confirmation was carried out by intradermal adrenaline injections of several dilutions of adrenaline (Daihan epinephrine, Daihan Pharma Co. Ltd., S. Korea). 0.5 ml of dilutions of adrenaline of $1:10^3$, $1:10^4$, $1:10^5$, and $1:10^6$ were re injected 10 cm distance from each other on the side of the neck. The resultswere read 20 minutes later based on the sweat at the region of the injection. No sweat at higher than $1:10^3$ dilution was considered to be positive and sweating at all concentrations were categorized as negative. Normal saline was used as control (Brown and Bertone, 2002, Pascoe and Knottenbelt, 1999).

Eleven out of fifty horses (22%) tested positive in the intradermal epinephrine administration test (Table 1). The Thoroughbred racehorses at Busan Race Park of Korea Racing Authority in South Korea were imported from Australia, Japan, New Zealand and the United States of America. Those that tested positive are horses of domestic origin and from Australia. There was no sex, foaling country, coat color, age or pedigree of dam predilections.

The prevalence of anhidrosis was 11% at the farm level and 2% at the animal level. The odds of anhidrosis were 2.13 and 4.40 times as high in farms located in central and southern Florida, respectively, compared with odds for farms in northern Florida. The odds of anhidrosis were 5.26 and 15.40 times as high in show and riding instruction operations, respectively, compared with odds for ranch operations (Johnson et al., 2010). At the animal level, breed, foaling place, and family history of anhidrosis were significantly associated with anhidrosis (Johnson et al., 2010). The disease commonly occurs in countries with hot, humid climates including the American Gulf Coast states. The precise prevalence of the disease is unknown; however, it has been estimated that up to 20% of horses in the Miami area of Florida may be affected (Mayhew and Ferguson, 1987, Warner and Mayhew, 1982).

The horse is able to sweat at higher rates than any other animal, and it is actually extremely efficient at dissipating heat produced during exercise (Marlin and Nankervis, 2002). The primary means of heat dissipation in the horse is evaporation of sweat (Hodgson and Rose, 1994). However, horses have a relatively low surface area to body weight ratio compared with other species. This may present a limitation to the efficacy of sweating in the horse (Hodgson and Rose, 1994). Affected horses often present with a history of poor or decreased exercise performance or exercise intolerance (Hinchcliff and Snyder, 2004). These cases are career ending, economic loss to owner and serious animal welfare issues (Colahan et al., 1999). It has been estimated that up to 20% of horses in the Miami area of Florida may be affected but the prevalence of our study was 22 % (McCutcheon and Geor, 1998). Moreover, there was no predilection of age, coat color, sex, age, or breed and these results are in accordance with other study (Breuhaus, 2009). Diagnosis is based primarily on clinical signs (Hodgson and Rose, 1994). Differential diagnoses are *Culicoides* spp. hypersensitivity, dermatophilosis, dermatophytosis, sarcoidosis, pemphigusfoliaceus, other systemic illnesses with poor or restrictive performance and high respiratory rates (Pascoe and Knottenbelt, 1999). No medical treatments have been consistently beneficial (Colahan et al., 1999). A variety of nutritional supplements have been advocated on the treatment of anhidrosis, but objective data on the efficacy of these products are, not available (Hinchcliff and Snyder, 2004). The most logical treatment is to move the horse to a cooler, more arid climate (Hubert et al., 2002). An overall disease prevalence of 6.12% was observed in Florida. Training horses and nonpregnant broodmares had a predilection for the disease. Adolescent horses were infrequently affected. There was no correlation with sex or color (Mayhew and Ferguson, 1987). Horses with a family history of anhidrosis should be examined by a veterinarian for diagnosis of this condition before they are exposed to exercise in a hot and humid climate (Johnson et al., 2010).

There is a higher possibility of anhidrosis in South Korea especially because of the climate with high temperature and humidity. It is important to find a way to reduce the mortality rate from high temperature and to prevent economic

Table 1. Prevalence of anhidrosis in Thoroughbred horses

Sex	No. of normal horses (n = 39)			No. of non sweaters (n = 11)			Total
	Males	Geldings	Females	Males	Geldings	Females	
Herds	9	12	18	3	2	6	50
Rate (%)	18	24	36	6	4	12	100

loss by proper treatment. A periodical inspection of in and out horses and a prompt notification of anhidrosis management to the trainer and owner could be a solution to maintain healthy horses.

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