"Post Race Distress Syndrome" in Thoroughbred Racing in South Africa

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SUMMARY

Post Race Distress Syndrome (PRDS) as recognised in South Africa and reported worldwide under a variety of names is investigated by a retrospective analysis of data maintained over a period of twenty one years by the National Horseracing Authority of South Africa (NHA).

The condition is characterised by pathognomonic symptoms that appear in the immediate post-race period and vary in severity from mild distress to total collapse. Attempts to reproduce this syndrome on treadmills or racing gallops have been unsuccessful and it appears that the associated stress of racing plays a major role.

The prevalence of PRDS is reported and the results of a series of investigations to identify risk factors for the condition are investigated and discussed. These factors include season, racing surface, age, gender, distance, ambient temperature and humidity, altitude, and anhidrosis. Comparative treatments are discussed as well as proposals for further investigation.

INTRODUCTION

The syndrome which is referred to in South Africa as “Post Race Distress Syndrome” (PRDS), has been reported in racing jurisdictions throughout the world under a variety on names including heat stress, heat exhaustion, post race collapse, post exertional distress (Scollay, 2001). Exercise-induced heat exhaustion is well described in horses performing high intensity exercise over an extended period (Marlin, 1998).

The above terms would not appear to accurately describe the syndrome, emphasizing only the involvement of temperature and do not adequately highlight the multifactorial nature of the condition. To date there have been no published reports giving a case definition for this syndrome.

PRDS has been recognized in South Africa since the 1980’s and has been incorporated in standard veterinary reports. The aim of this paper is to report on the prevalence of PRDS on specific race-tracks in South Africa between 1987 and 2008 and investigate the influence of various factors on the prevalence of PRDS.

MATERIALS AND METHODS

This study was carried out over a period of 21 years, from the 1st August 1987 to the 31st July 2008 and includes all runners in flat races on 6 racecourses consisting of 6 turf tracks and 2 sand tracks. The tracks involved were all in the Central Province District of South Africa which is on the Highveld at an altitude of approximately 1600m. All observations were made by at least one of 4 veterinarians in the full time employ of the National Horseracing Authority of South Africa (NHA) and. the racing records and veterinary report data were obtained from the NHA's computerized data recording system.

A case of "Post Race Distress Syndrome" is normally characterized by the following:
1) clinical signs are invariably observed post-race during or following unsaddling,
2) initially the horse walks slower than expected with its head held lower than normal,
3) this may progress to include a degree of head shaking and mild to severe ataxia,
4) from the outset affected animals demonstrate a characteristic "glassy-eyed" look and appear to be disassociated from their surroundings, failing to respond normally to external stimuli, and
5) many cases will come to a standstill and refuse to move forward and if forced may rear over backwards or lunge forwards.

While the majority of cases are mild and respond rapidly to conservative treatment, the severity of the condition varies, with progression to severe ataxia and collapse occurring in about 5% of cases. Any horse showing clinical signs of respiratory distress associated with upper airway obstruction or epistaxis was not recorded as a case of PRDS.

The prevalence of PRDS (expressed as a percentage) was calculated by dividing the number of cases recorded in a specific category by the number of runners included in that category. The effects of season, track surface, time of day, race distance, age, gender, altitude (geographic location), anhidrotic status, furosemide administration and the wearing of blinkers were investigated. Heparinised blood samples were collected post race from 13 cases and plasma chemistry analysis performed using an Abbot I Stat Handheld Analyser with Chem 8 Test Cartridges. These data were compared with data from 94 control horses from which blood samples were also collected post-race. A total of 9 horses which had demonstrated PRDS, were subjected to a semi-quantitative horse sweat test according to the recommended protocol (Guthrie *et al.*, 1992). The prevalence of PRDS in furosemide treated versus control horses competing in simulated races examining the effect of furosemide on exercise-induced pulmonary haemorrhage, was also investigated.

Where appropriate, relative risk (RR) was calculated along with a 95% confidence interval and a probability of this being different from 1, using MedCalc Software (Mariakerke, Belgium). Serum chemistry data were subjected to a t-test. Significance was set at $p < 0.05$.

RESULTS

Out of a total of 375 701 runners included in the survey there were 488 (0.13%) cases of PRDS. Of these cases, 76 horses demonstrated PRDS on more than one occasion. The total number of individual horses that ran in these races was 33 174 and of these 376 (1.1%) demonstrated PRDS. The prevalence of PRDS in the different months varied from 0.23% in January to 0.08% in June (Figure 1). The PRDS prevalence data for tracks in Central Province was associated with the average monthly maximum temperature. The prevalence of PRDS in horses racing on sand tracks was significantly greater (RR = 2.25, $p < 0.0001$) than that for horses racing on turf. Similar data were obtained when the prevalence of PRDS was considered at the Vaal Racecourse only, which has both sand and turf tracks. The prevalence of PRDS was significantly higher in horses running during the day (RR = 4.05, $p = 0.0032$) than those competing in night races, (after 18h00) at the Newmarket Racecourse (Figure 2). The prevalence of PRDS increased significantly with race distance (Figure 3). The prevalence of PRDS was significantly higher in horses older than 2 years. The relative risk of PRDS associated with 3 year olds competing was 2.68 ($p < 0.0001$), of 4 year olds competing was 3.46 ($p < 0.0001$) whilst that of five years and older competing was 3.29 ($p < 0.0001$) when compared to 2 year olds. The prevalence of PRDS was significantly higher in males than females (RR = 1.26, $p = 0.0152$). A comparison between the prevalence in PRDS in horses of different ages and genders is shown in Figure 4. PRDS was significantly more common in horses that raced on turf in Durban at sea level than in horses that raced on turf in Johannesburg at an altitude of in excess of 1600 m above sea level (RR = 1.65, $p = 0.0002$). Of the blood serum chemistry variables investigated, the sodium, ionized calcium and haemoglobin concentrations were significantly decreased whilst the potassium concentration was significantly increased in PRDS cases (Figure 5). The prevalence of PRDS was significantly higher in horses that wore blinkers during races (RR = 1.28, $p = 0.0069$) and was higher in horses that received furosemide in simulated races (RR = 5.47, $p = 0.1120$).

DISCUSSION

This syndrome is associated with several specific clinical signs and symptoms. Firstly, it only occurs on a race day after the completion of a race and has not been observed after training gallops nor has it been reproduced on a treadmill. It would appear that the stress of racing plays an important role and that certain horses are more susceptible than others. While in many cases it is a one off occurrence, in others it has occurred on several occasions, sometimes consecutively, and has necessitated the animals involved being suspended from racing. The history of affected animals has not identified any possible pre-disposing factors, nor has clinical examination of affected animals at the time or on follow up demonstrated any significant abnormalities. Heart and respiratory rates in affected horses were no different to those normally observed post-race.

The treatment regime employed is obviously dictated by the severity of the initial symptoms. In the majority of cases these are mild and simply hosing the horse down with cold water is sufficient to achieve recovery. To this end hoses are strategically placed near the winning boxes and in the unsaddling area. When presenting symptoms are more severe, or there is a failure of the horse to show a rapid response to hosing, then parenteral administration of soluble corticosteroids is recommended. The treatment of choice for such cases was Betsolan Soluble (Glaxo) containing 2mg betamethasone sodium phosphate per ml at a dosage rate of 20 ml, intravenously. This product was taken off the market and various other related licensed veterinary products were tried instead, none of which appeared to be as effective. As a result we are now using an equivalent human preparation Celestone (Schering Plough) in a 5ml vial which contains 4mg Betamethasone sodium sulphate per ml. The dose routinely given is 10ml intravenously.

In the small percentage of cases which do not respond to the above treatment, more intensive treatment, in particular sodium bicarbonate infusion, appears most effective. The response time can be extremely variable but not one case has failed to respond. Recovery in indicated when the “glassy-eyed” look disappears.

There is a definite seasonal variation with a reduced prevalence during the winter months when the temperature and humidity are generally lower and therefore the environmental heat load effect is less pronounced. This lower winter prevalence may also be associated with the firmer going experienced due to the lack of winter rainfall compared to the more yielding going experienced in the wetter summer months. The firmer going logically requires less exertion than would occur on the heavier going. It may also be influenced by the fact that our poorer horses are running, in what is basically the off season, and they may well suffer less stress simply by being less competitive.

There are two sand tracks in the area under study and the results demonstrate clearly that the prevalence of PRDS is significantly higher on sand than on turf. Race times on sand are slower with an associated higher workload and therefore more stress per unit distance. The metabolic heat production is therefore likely to be higher, thus predisposing to PRDS. It is also likely that the radiated heat load may well higher on sand than turf. These factors should be taken into account when planning programmes for sand as opposed to turf races. The significantly higher risk of PRDS occurring

during day racing as opposed to night racing on the same track, highlights the importance of the environmental heat load on the occurrence of this syndrome.

The increased prevalence of PRDS associated with increased race distance also illustrates the effect of greater stress associated with the higher metabolic heat load. The lower prevalence of PRDS in two year olds is probably also related to this due to the fact that these horses generally run over shorter distances than the older horses.

The overall higher prevalence seen in males as compared to females requires further investigation as in this study no differentiation was made between entires and geldings. This is particularly interesting in older horses where there is no difference in the prevalence of PRDS in males and females where the vast majority of the male horses are geldings. This is in contrast to the two year olds where a higher percentage of the males are colts.

The comparison between altitude and sea level was based on an analysis between the population of runners at three turf tracks at the same altitude (1600m) in Johannesburg as opposed to runners at two turf tracks, both at sea level, in Durban over the same period. The climate in Durban is more temperate and humid, whilst that in Johannesburg is considerably less humid with larger temperature ranges. The observed differences between the prevalence of PRDS at these two centres is thus probably due to the increased environmental heat load at the coast and not an effect of altitude.

Whilst most of the blood chemistry variables showed no significant differences between a limited number of PRDS cases and a control group, the sodium, ionized calcium and haemoglobin concentrations were significantly decreased in the PRDS cases as opposed to the potassium concentration which was significantly increased. Similar findings are observed in partially anhidrotic horses after exercise and it was therefore hypothesized that PRDS may be associated with partial anhidrosis. Preliminary studies on a very limited number of PRDS cases has revealed a normal response to a sweat test, which therefore does not support this hypothesis. Further studies on larger numbers of cases will be necessary to elucidate the mechanisms responsible for these observed changes.

The higher prevalence of PRDS in horses racing with blinkers may either be due to the increased stress of restricted vision or it may be that there is reduced heat loss due to this equipment. Removal of the blinkers in mild cases has been observed to be sufficient to cause a reversal of the condition without other therapy. It may be preferable to use mesh blinkers, or indeed soak the equipment in water before use, particularly on days when the environmental heat load is high and could be associated with an increased risk.

During a recent study investigating the effect of furosemide on exercise induced pulmonary haemorrhage in simulated races, the prevalence of PRDS in untreated horses was 1.20% while in treated horses the prevalence of PRDS was 7.32% (RR = 5.47, $p = 0.112$). It would appear however that furosemide administration in the pre-race period may well contribute to the occurrence of PRDS. Whether this is due to the associated dehydration caused by the furosemide administration, and whether the withholding of water pre-race may also predispose, requires further investigation.

The importance of environmental factors, particularly ambient temperature, high humidity and prevailing winds are obvious, but the other factors discussed play major roles in the prevalence of this syndrome and must all be taken into account when considering risk. Limited comparisons between rectal temperatures post race in normal and affected animals have produced no significant results. Investigation into the use of thermal microchips positioned near to or in muscles with a high metabolic rate during exercise and the relationship between this and core temperature are currently being undertaken. If the latter is successful then implanting chips into horses which have demonstrated PRDS will be carried out in an attempt to collect reliable data to show that abnormally high core temperature is the main causative factor for PRDS.

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FIGURE LEGENDS

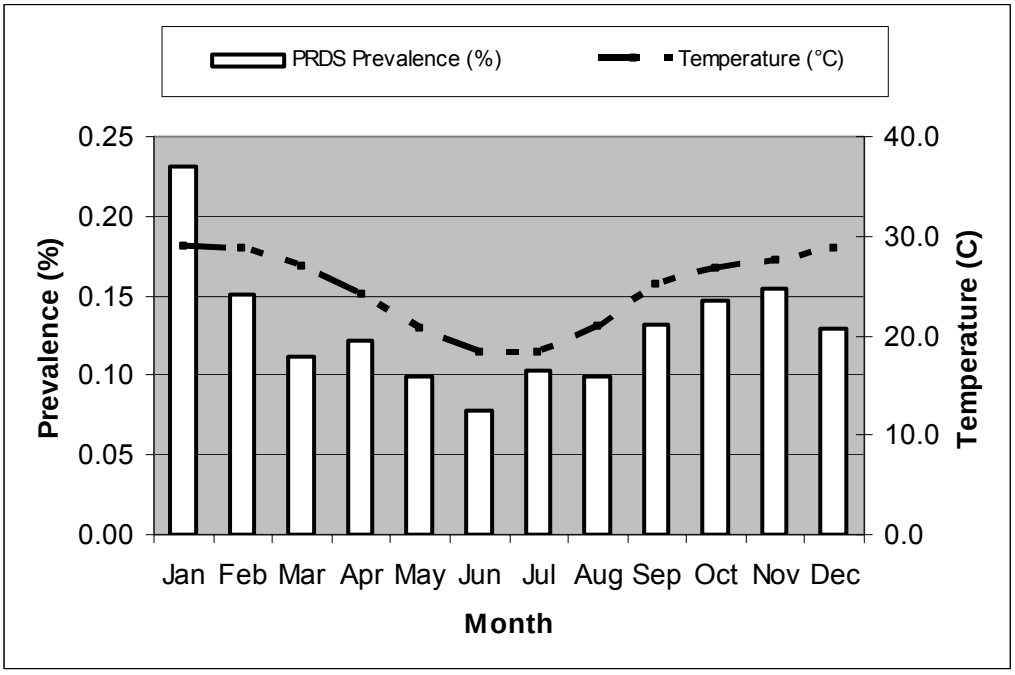
Figure 1: Monthly prevalence of Post Race Distress Syndrome (PRDS) in thoroughbred racehorses competing at selected racetracks in South Africa from 1st August 1987 to 31st July 2008 and average monthly maximum temperature.

Figure 2: Prevalence of PRDS in racehorses competing during the day or at night (after 18h00) on Newmarket Racecourse from 1st August 1996 to 31st July 2008 (RR = 4.05, $p = 0.0032$).

Figure 3: Prevalence of PRDS in racehorses competing over different distances from 1st August 1987 to 31st July 2008. The Relative Risk of PRDS associated with competing in races over 1201 to 1600 m was 1.82 ($p < 0.0001$) whilst that associated with competing in races of more than 1600m was 2.30 ($p < 0.0001$) when compared to competing in races of less than 1200m.

Figure 4: Prevalence of PRDS in racehorses of various ages and genders competing in races from 1st August 1987 to 31st July 2008.

Figure 5: Means and standard deviations of sodium, potassium, chloride and ionized calcium concentrations, total carbon dioxide, glucose, blood urea nitrogen, creatinine and haemoglobin concentration and anion gap in blood samples collected post race from horses with PRDS and a control group of horses. Variables indicated with an asterisk were significantly different ($p < 0.05$) between PRDS cases and controls.



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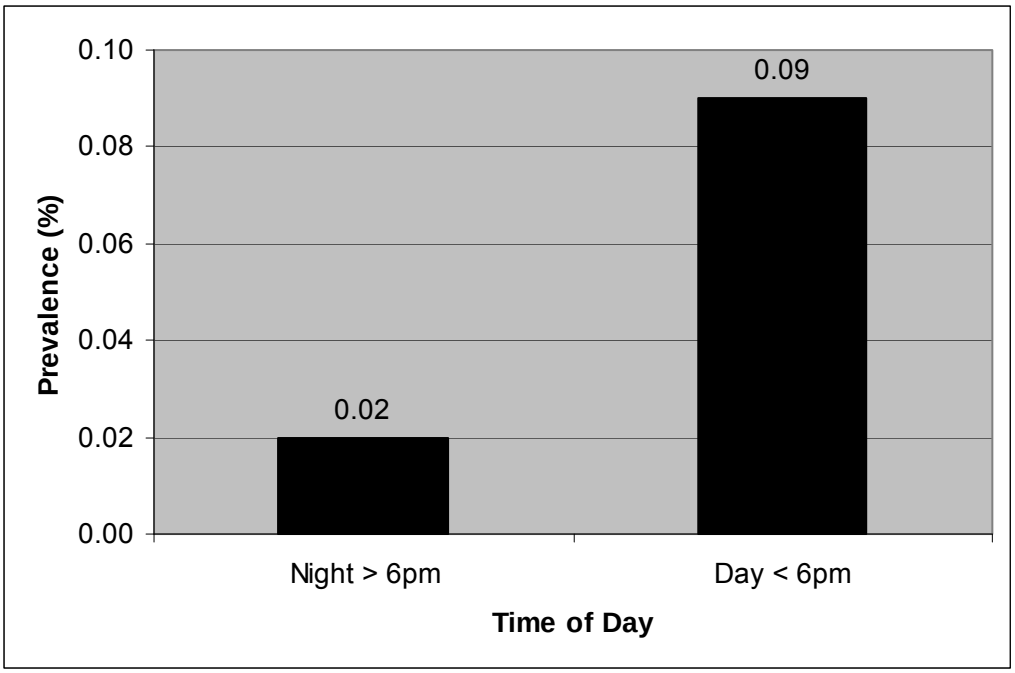

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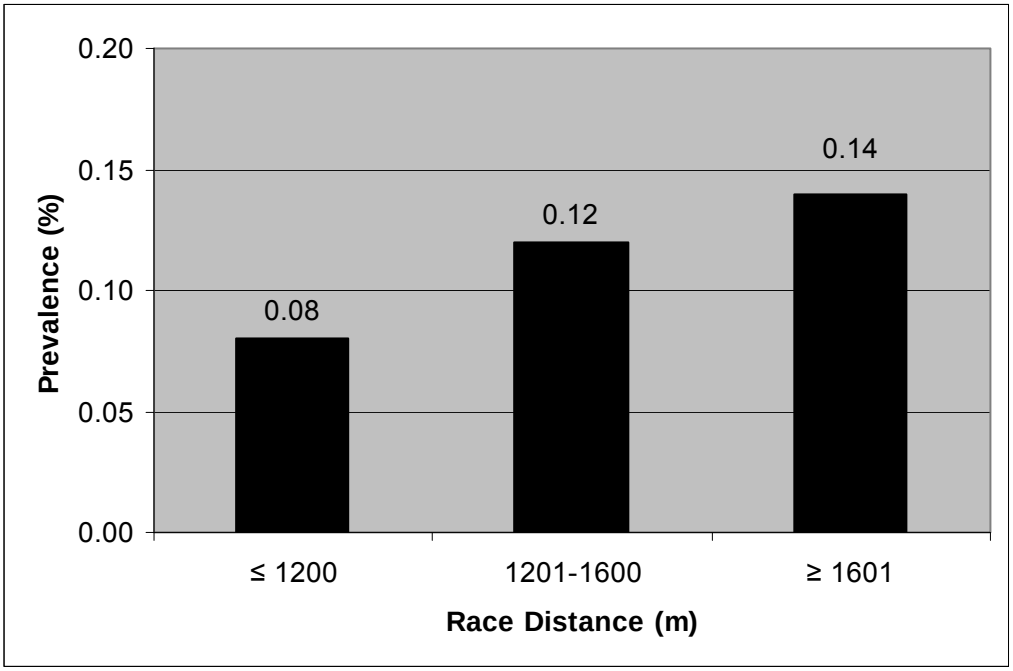

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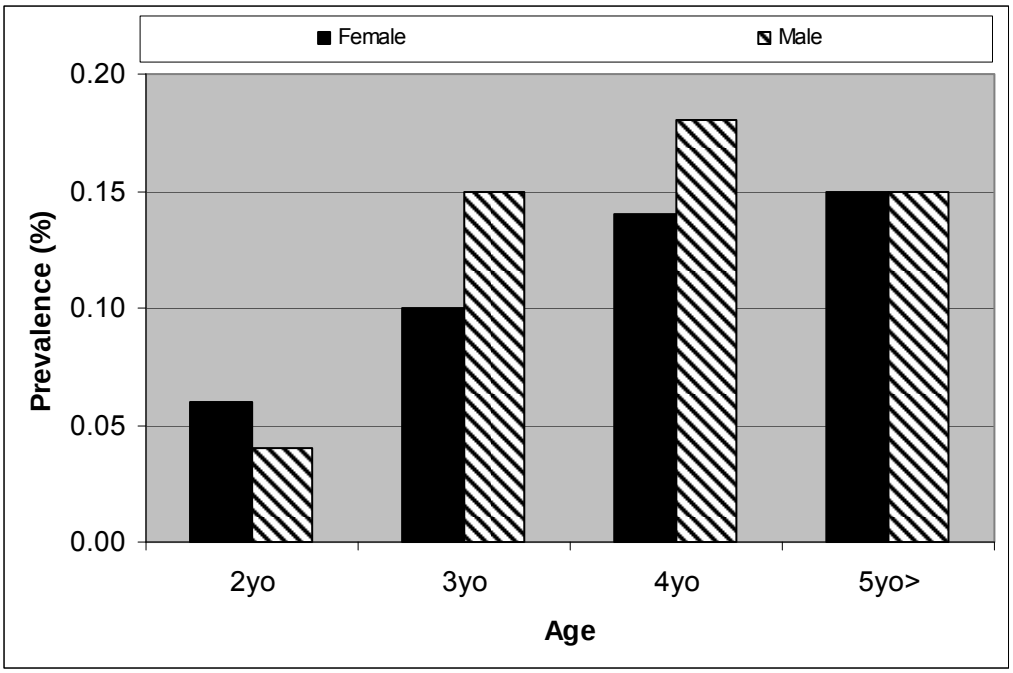

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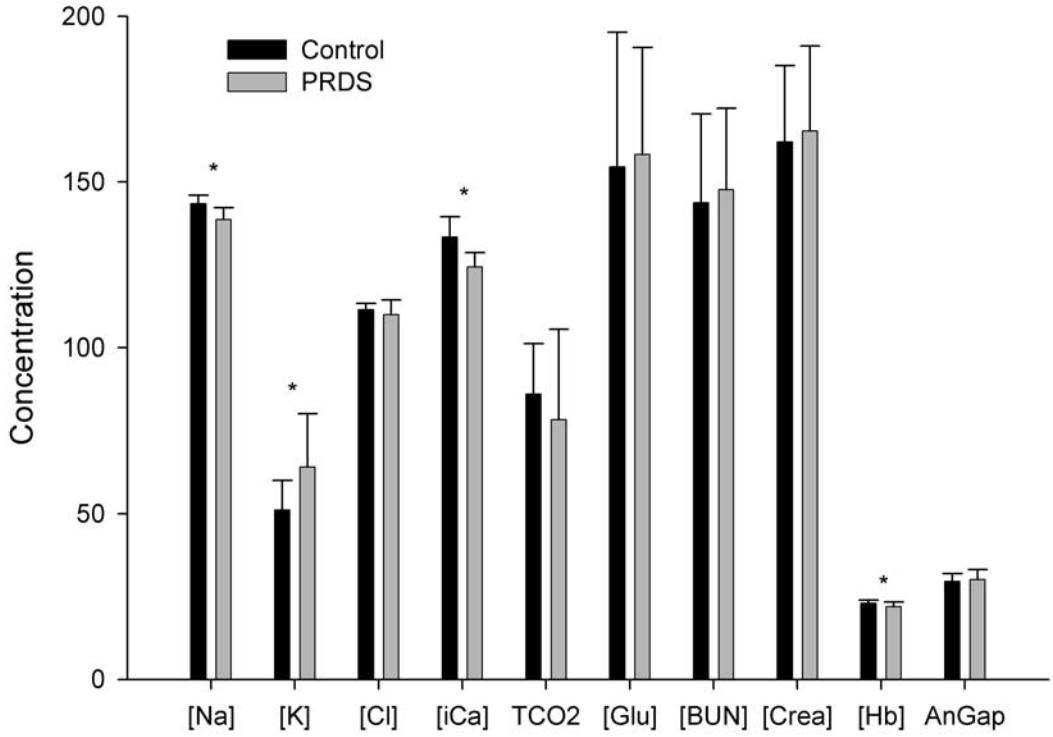

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