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HYDRATION STATUS OF ENDURANCE HORSES AS AFFECTED BY DIETARY FIBER TYPE WITH AND WITHOUT SUPPLEMENTAL FAT

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HYDRATION STATUS OF ENDURANCE HORSES AS AFFECTED BY DIETARY FIBER TYPE WITH AND WITHOUT SUPPLEMENTAL FAT

By

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ABSTRACT

HYDRATION STATUS OF ENDURANCE HORSES AS AFFECTED BY DIETARY FIBER TYPE WITH AND WITHOUT SUPPLEMENTAL FAT

By

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Water and electrolyte loss from prolonged endurance exercise may result in physiological disturbances in the horse. The large intestine has been suggested to serve as a water reservoir and may help attenuate dehydration. Dietary constituents may affect the amount of water held within the intestine and available for use by the horse. Our initial study examined the hydration status of horses fed three dietary fiber types and subjected to a 60-km exercise test. After an initial training period and preliminary exercise test, horses were assigned to a replicated 3 x 3 Latin Square experiment. Diets were grass hay (G), 50:50 grass hay: alfalfa hay (GA), and 50:50 grass hay: proprietary chopped fiber mix (GM). Total body water (TBW) tended to be higher ($p < 0.08$) in horses consuming GA and GM than G (65.8 ± 0.8, 65.4 ± 0.8, and 63.9 ± 0.8%, respectively). Body mass (BM) due to diet was not different at the start of the exercise test, but when corrected for fecal loss and water intake showed a trend for diet difference during exercise ($p = 0.08$), decreasing more in GM than G (5.1 ± 0.4% vs. 3.4 ± 0.4%; GA 4.2 ± 0.4%). Heart rate was not different except at the end of bout one when the heart rate of GM was lower than G or GA ($p < 0.01$). Core body temperature, although not different at the start of the exercise test bout, was lower ($p < 0.05$) at the canter in horses consuming GM. Results suggest higher TBW in the GM diet at the initiation of exercise may have provided the horses with a greater "pool" of

available water for increased thermoregulation via sweating, allowing maintenance of a lower core body temperature during exercise but at the expense of increased BM loss. However, because the GM diet was higher in fat content, the increase in fat intake may have been responsible for the difference observed, thus meriting further investigation.

Our second study was designed to examine the effect of dietary fiber type on hydration status, with and without fat supplementation. In a split-plot design, six two-year-old Arabian horses were randomly assigned to diets containing either chopped grass hay (G) or a chopped grass hay: soluble fiber mix (GM) and either fat supplementation (Ft) or no fat supplementation (NFt). All horses consumed each diet for a period of at least 21 d before completing a 60-km exercise test. Total body water, as determined using D_2O, was 66.1% of body mass and did not differ due to treatment. Horses consuming GM had greater ($p < 0.05$) body mass at the start of exercise than those consuming G. Water consumption during the exercise test was greater in G than GM ($p < 0.01$; 13.3 ± 1.3 L, 10.9 ± 1.3 L), as were PCV ($p < 0.01$; G 36.8 ± 1.2, GM 35.1± 1.2) and plasma aldosterone across all times ($p < 0.001$; GM 28.4 ± 3.8 pg/ml, G 53.3 ± 3.8 pg/ml). The results suggest that fiber type plays a greater role in hydration status than does fat supplementation. However, in comparison to a previous study, a higher TBW and lower core body temperature during exercise in this study may suggest that the chopped nature of the fiber may benefit the animal and thus may merit further investigation.

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CHAPTER I

Introduction

Throughout the last century, the role of the horse in American society has shifted from a beast of burden or means of transportation to recreational partner or companion. The popularity of equestrian sports as a recreational activity continues to rise. Endurance riding is one such equestrian event that has gained in popularity both in North America and abroad. Globally, endurance riding is one of only seven sports recognized by the Federation Equestre Internationale (FEI), the world governing body for equestrian sports. Designated by FEI as a national discipline club, the American Endurance Ride Conference (AERC) sponsors more than 700 rides annually in the United States and Canada (Anonymous, 2006). The AERC sanctions both endurance rides (greater than 128 km) and limited distance rides (40-56 km). Horses compete to finish the ride in the fastest time, but also for a coveted best conditioned award, selected in part by ride veterinarians. All sanctioned events feature mandatory rest stops and veterinary examinations during the course of the ride at which the horse must be deemed "fit to continue" in order to remain in the competition. Horses may be eliminated at these checkpoints due to lameness, metabolic disturbance, or other conditions as determined by the ride veterinarian(s).

While not often reported as a cause of elimination, dehydration is a common result of prolonged exercise. Maintenance of body water requires balancing intake with sweat, fecal, urinary, and respiratory losses. In endurance horses in particular, sweat losses tend to be much greater than water intake even as the horses are commonly offered fluid and electrolytes during rest stops. Yet given the length (both time and distance) of such endurance activities and the relatively small surface area to mass ratio of the horse, such intense sweating and respiratory fluid loss are not surprising as the horse works to rid itself of excess heat produced during the exercise bout.

Initial research examining dehydration in endurance horses focused on quantifying sweat losses. Research then examined strategies for replacing fluid and electrolyte loss after exercise. More recently, research has examined the role of dietary interventions in attenuating dehydration in endurance horses. The use of dietary interventions would be well received by endurance riders, being both easy to administer as well as being a pro-active response.

As the equine large intestine has been suggested to serve as a reservoir for water and electrolytes, research has focused on the role of dietary fibers in binding and releasing water within the hind gut. Initial research suggested more soluble fiber types may possess greater water holding and releasing capacity. Thus, this research was conducted to investigate the effect of different dietary fiber type on the hydration status of horses subjected to prolonged endurance exercise. The results, then, could aid in the development of feeding recommendations for the expanding endurance horse industry.

CHAPTER II

Literature Review

Thermoregulation during Endurance Exercise

Increased muscle metabolism as a result of exercise is inefficient and results in excess body heat that must be dissipated. When an animal expends energy approximately 80% of that energy is lost as heat. In an endurance horse exercising at a mean speed of 8 m/s, the metabolic heat produced is approximately 0.6 mJ/min. If no heat were dissipated, this would result in an increase in core body temperature of 21° C per hour (Guthrie and Lund, 1998). Such a temperature increase is not compatible with vital life functions. Fortunately, in the horse, around 90% of heat produced during exercise is quickly dissipated (Kingston et al., 1997a).

Heat dissipation can occur through four mechanisms: radiation, convection, conduction, and evaporation. Conduction, convection, and radiation are of little importance to the horse (particularly at high ambient temperatures), but evaporation of sweat and water from the respiratory tract are of vital importance (McConaghy, 1994). Conduction can best be described as the direct transfer of heat between surfaces or between the animal and the environment (Cena and Monteith, 1975b). In the exercising horse, this transfer would be into the air which has low thermal conductivity and thus heat transfer by conduction is minimal. Convection, then, is the transfer of heat between two surfaces at different temperatures. Convection is increased as the difference in temperature between the two surfaces increases, as well as when the animal encounters moving air (Guthrie and Lund, 1998). Heat transfer through radiation involves the absorption or emission of electromagnetic radiation. The most common form of radiation for the horse is the absorption of sunlight. When animals are exposed to bright sunlight, the heat load from sunlight can be as much as 15% of the maximal metabolic heat production (Cena and Monteith, 1975a). Evaporation of sweat is the primary means through which heat is lost in both horses and humans (McConaghy, 1994). Evaporation of 1 L of water can dissipate approximately 575 kcal of heat, or an amount equivalent to heat produced from about 6 minutes of endurance exercise (Guthrie and Lund, 1998). Evaporation of water from the respiratory tract can also be a means for heat dissipation. Some estimates suggest loss through respiratory evaporation may be as high as 15 to 25% of total heat loss, or about 1.15 kcal/min at rest and 12.18 kcal/min at the trot (3.5 m/s), although this is dependent upon humidity and ventilation rate (Heilemann et al., 1990).

As the main route of evaporative cooling in the equine is sweating (Carlson, 1983), sweat rates in the horse may exceed 40 ml/m^2/min or more than 12 L/h for an average sized horse (Hodgson et al., 1993). This sweating rate may be the highest in the animal kingdom (Marlin et al., 1999). Sweat rate, however, is dependent upon exercise intensity, and endurance exercise (approximately 40% VO_2max) has been reported to illicit lower sweating rates of approximately 6.5 L/h (Hodgson et al., 1993). However, the prolonged duration of such endurance exercise results in much greater sweat loss over the course of the exercise bout compared with short, high intensity exercise.

Sweat rate may be affected by heat acclimatization in exercise trained horses. After 21 d of heat acclimatization, McCutcheon et al. (1999) found the onset of sweating to occur at a lower pulmonary artery temperature. This was in agreement to Marlin et al. (1999). At the same time, however, McCutcheon et al. (1999) found a reduction in fluid loss over the course of the exercise test, attributable to a rapid decline in sweat rate during recovery. Geor et al. (2000) observed a similar decrease in mean sweating rate in exercised pre-trained horses in hot dry and hot humid environments.

Although the sweat rate in the horse is high, the horse's ability to thermoregulate may remain limited. First, evaporation of sweat is dependent upon environmental factors. As expected, increased ambient temperature has been shown to increase sweating rate (McCutcheon et al., 1995a) while reducing convective heat loss. As relative humidity increases, the rate of evaporation of sweat is lower and thus the effectiveness of evaporative cooling is lessened. When sweat production is greater than the rate at which sweat evaporation can occur, sweat can drip from the skin, losing the benefit of evaporative heat loss. Combining high humidity with high ambient temperatures may then greatly impair heat dissipation. McCutcheon et al. (1995a) demonstrated that while sweating rate was unchanged by high humidity, horses reached a critical core temperature (41.5° C) during exercise twice as quickly in hot, humid conditions than hot, dry conditions, thus demonstrating a reduced capacity to transfer body heat.

Secondly, the reduced surface area to body mass ratio of the horse compared with other species limits the efficiency of sweating. Combined with increased muscle mass, and increased utilization of muscle mass, this means the horse may still accumulate much greater heat load when compared to its human counterpart, even with a higher sweat rate (Lindinger, 1999).

Still, it is important to point out that not all heat accumulation is detrimental. The onset of exercise brings a rapid accumulation of heat before dissipation mechanisms are activated. Core body temperature, therefore, rises before reaching a plateau. This elevation in temperature may improve muscle performance through changes in enzyme kinetics, facilitate the release of oxygen from red blood cells, and increase maximum heart rate (Guthrie and Lund, 1998). Yet, excessive heat accumulation as the result of an imbalance between heat production and dissipation during prolonged endurance exercise may have detrimental and even life threatening consequences for the horse and must be considered.

Body Fluids in the Horse

Essential for all life functions, water is the most abundant molecule in the body representing about 98% of the molar composition (Johnson, 1988). Total body water (TBW) refers to the sum of all water within the animal. Despite variations in water intake and water loss, total body water remains relatively constant and is generally 65-70% of total body weight (Carlson, 1983). Total body water may vary within this range as a result of age, sex, nutritional state, environmental factors, and water intake.

An animal's total body water is divided into two major compartments, intracellular fluid (ICF) and extracellular fluid (ECF). The ICF represents all water within the cells. The ECF is not a discrete space, and instead represents all fluid outside of the cells, including plasma, interstitial fluid, lymph, and gastrointestinal fluid and secretions (Carlson et al., 1979). The ICF contains approximately two thirds of the TBW (or 200 L in a 500 kg horse), while the ECF contains 1/3 (or 100 L in a 500 kg horse). Plasma volume, then, represents 20-25% of ECF or about 50 ml/kg of body weight (Rose, 1994).

As the movement of water between compartments is primarily through osmosis, the ICF and ECF remain in osmotic equilibrium, although the ionic composition is quite different. The ICF is composed of a high concentration of K and phosphate, with lower concentrations of Na, Cl, and Ca. Conversely, the ECF is composed primarily of Na and Cl, with low concentrations of bicarbonate, K, organic phosphate, Ca, and Mg (Johnson, 1988).

Fluid Shifts during Exercise

The onset of exercise may result in drastic fluid shifts. The production of osmotically active metabolites such as inorganic phosphate, creatine, and lactate in working muscle cells contributes to the flow of water from the vascular space to muscular intracellular and interstitial space. Thus, plasma volume at the onset of exercise may decrease as much as 15%, although this is exercise intensity dependent (Carlson, 1983).

Fluid shifted into the interstitial space through the initiation of exercise is then available for sweat production. As sweat production during endurance exercise is initiated, because sweat in the horse is hypertonic to plasma, no osmotic gradient exists between plasma and ICF. Thus, plasma must initially bear the majority of the fluid loss (Carlson, 1983). While prolonged exercise in other species then results in a shift of fluid back from ICF to ECF (Nose et al., 1988), this may not be the case in the horse. As demonstrated by Lindinger et al. (2004), loss of TBW in the horse during submaximal exercise was strictly the result of ECF loss. In the study, loss of total body water, entirely borne by ECF, decreased 4.2% as a result of horses trotting on the treadmill for 75-120 min. The authors suggest reasons for the maintenance of ICF at the expense of ECF may include: increased working muscle mass as a percentage of total body mass, increased intracellular osmotic forces preventing fluid shifts from cells, and a sweat rate and composition that minimizes exercise-induced increases in extracellular osmolality.

Kronfeld (2001b) suggests that osmolality of fluid lost is responsible for the direction of fluids shifts in the endurance horse. If the animal were to lose isotonic fluid, rapid equilibrium would occur between fluid compartments. Loss of hypotonic fluid (such as human sweat or respiratory water) results in hypertonic plasma, which can be beneficial in drawing water out of cells or the gut to replace plasma volume loss. However, because horse sweat is often hypertonic to plasma, he suggests such loss leads to hypotonic plasma and interstitial fluid, which further exacerbates any fluid loss by driving fluid into cells and perhaps the gut and also inhibiting thirst.

Sweat Properties and Composition

The equine sweat gland is a tubular exocrine skin gland consisting of a highly coiled secretory portion, known as the fundus, and a serpentine duct. Each gland is associated with a hair follicle (McEwan Jenkinson et al., 2006). The average number of glands per square centimeter of skin ranged from 535-1128 (Watanabe et al., 1993). In contrast to other species, the equine sweat gland has a rich blood supply capable of rapidly modifying blood flow toward and away from the skin surface (McEwan Jenkinson et al., 2006).

Unlike humans, where high variability has been reported, individual differences in sweat properties and composition do not seem as great in the horse and thus are generally presented as means across breeds and individuals. The pH of horse sweat has been reported to be strongly alkaline, generally in the region of 8-9 (McEwan Jenkinson et al., 2006). Sweat osmolality is generally considered to be isotonic or hypertonic to plasma and has been reported to vary from 300-339 mOsm (Kingston et al., 1997a; McCutcheon et al., 1995a).

The electrolyte composition of equine sweat is primarily Na^{+}, K^{+}, and Cl^{-}. Reported concentrations of these electrolytes in horse sweat are shown in Table 1. Electrolyte composition has been positively correlated with sweat rate (Kingston et al., 1997a) and may be a function of collection method. At the same time, epinephrine has been shown to cause more dilute sweat production (Carlson and Ocen, 1979; Kerr and Snow, 1983), which may result in more dilute sweat produced in response to high-intensity exercise as a result of epinephrine activity. Kerr and Snow (1983) reported Na, K, and Cl concentrations of 194, 24, and 207 mmol/L, respectively, in horses exposed to prolonged epinephrine infusion.

Like the electrolytes, Ca and Mg concentrations in equine sweat may be highly variable; however, concentration of these minerals appears to vary with sampling time. Both Ca and Mg have been shown to decrease over the course of an exercise bout but averaged 4.8 and 3.3 mmol/ L, respectively (McCutcheon et al., 1995b).

Equine sweat also contains high levels of protein. Protein content has been reported to range from 5-10 g/L (McEwan Jenkinson et al., 2006). Like Ca and Mg, protein concentration may decrease with prolonged exercise. Kerr et al. (1980) reported protein concentrations of 10 g/L decreasing to 1.3 g/ L after 4 h. The major protein present in equine sweat has been named latherin for its proposed role in helping to move sweat to the end of the hair follicle thus aiding in heat dissipation and leading to the presence of lather often observed in the sweating horse (McEwan Jenkinson et al., 2006).

Table 1. Na^+, K^+, Cl^- composition (mmol/L) in equine sweat collected from exercising horses.

Reference	Conditions	Na+	K+	Cl-
(McConaghy et al., 1995b)		159	39.6	194
(Carlson and Ocen, 1979)		132	53.1	174
(McConaghy et al., 1995a)		144	37.5	182
(Snow et al., 1982)		159	32	165
(Geor and McCutcheon, 1996)	Cool dry	139	28	154
	Hot dry	167	33	181
(Jansson et al., 1995)		165	45	
(Kingston et al., 1997a)		110	30-36	140
(Rose et al., 1980)		249	48	301
(Kerr and Snow, 1983)		170	49	200

Other more minor sweat constituents have been reported. Equine sweat is reported to contain few lipids, while carbohydrates tend to be limited to those bound to protein. The presence of bicarbonate (HCO_3^-) has been noted and has been correlated to the level of alkalosis developed during prolonged exercise (McEwan Jenkinson et al., 2006). Finally, certain other plasma constituents when present in high levels may be excreted in sweat. These include glucose, urea, and some pharmaceutical agents such as phenylbutazone (McEwan Jenkinson et al., 2006).

Fluid Loss during Endurance Exercise

As previously described, the high sweating rate in the horse combined with the prolonged duration of endurance exercise may result in net body fluid loss. As total body fluid loss is often difficult to quantitatively measure, particularly in a field setting, body weight loss is commonly used as a method of estimating fluid loss in the exercising horse, with approximately 90% being the result of sweat losses (Kingston et al., 1997b). Snow et al. (1982) found average body weight losses to be 32.6 kg, or approximately 7%, with a single horse losing nearly 9% of body weight during an 80-km exercise test. Schott et al. (1997) reported body weight losses of 3-4% in horses competing over 80 and 160-km distances, even at moderate ambient temperatures. High speed endurance rides of 160-km, which are increasingly popular internationally, have been shown to illicit body weight loss of 5-7% even in highly trained animals, with individual animals loosing as much as 11.5% (Schott et al., 2006). Body weight loss during endurance exercise has also been observed in a laboratory setting in horses provided frequent access to water, as horses completing 60-km of treadmill exercise were observed to have losses around 3% (Dusterdieck et al., 1999).

Unlike in humans where sweating rate and resulting fluid loss may decrease with hypohydration, controversy exists over whether the horse possesses such a mechanism. A study by Kingston et al. (1997a) demonstrated that even with body weight losses of nearly 9%, horses continued to sweat with continued exercise, suggesting the horse's prioritization of thermoregulation over water balance. However, results of a study by Geor and McCutcheon (1998) suggest dehydrated horses may have reduced localized sweat rates and whole body fluid loss after prolonged exercise at high ambient temperatures.

Along with body weight changes for estimating total fluid loss, changes in total plasma protein concentration (TP) have also been utilized to examine changes in blood volume. A decrease in plasma volume would be represented by an apparent increase in total plasma protein concentration. Lucke and Hall (1980) observed a 20% increase in TP during a 42-km ride, while Rose et al. (1980) detected an 18.1% increase following a 100-km ride. In an 80-km exercise test at speeds of 16-18 km/hr, Snow et al. (1982) observed TP concentrations of 6.8 g/dl prior to exercise increasing to 8.6 g/dl at completion.

<u>Electrolyte Loss during Endurance Exercise</u>

Because equine sweat is hypertonic to plasma, prolonged endurance exercise may result in tremendous electrolyte losses. McCutcheon and Geor (1996) reported ion losses for horses competing in a simulated three-day event in hot conditions to be 62 g Na, 27 g K, 110 g Cl, and 2 g Ca in about 19 L of sweat. These losses were almost twice that of the same test when performed in cool conditions. Kingston et al. (1999) reported ion losses from sweat composition and body weight loss in horses completing 45 km of treadmill exercise. With 28 L of sweat loss, horses lost an average of 72 g Na, 33 g K, and 133 g Cl.

Unfortunately, measurement of plasma electrolyte concentration gives little information regarding electrolyte loss in sweat, as sweat is hypertonic to plasma, and many electrolytes have replacement pools within the body. For example, Schott et al. (1997) report no change in plasma Na over the course of 80 and 160-km endurance rides. Yet, up to 8.4% of the total plasma sodium content may have been depleted (Lucke and Hall, 1980). Only in extreme cases, such as high speed 160-km rides, has hyponatremia been reported with 3 of 13 horses in that study having Na concentration decreases of 10 mmol/L or more (Schott et al., 2006).

Of the electrolytes, Cl loss can be best reflected by plasma concentrations as Cl tends to be much greater in sweat than plasma, thus more quickly reducing the Cl pool. Plasma Cl has been reported to decrease as much as 15% over the course of an 80-km ride (Rose et al., 1980), although Schott et al. (1997) reported less than a 5% decline in a similar distance ride. The difference in the two studies, however, may be related to the possible administration of electrolyte pastes, as this was not controlled in the second study.

Plasma K values likely represent the flow of potassium into and out of muscle cells over the course of exercise and recovery, as well as sweat losses.

At the same time, plasma K is maintained at the expense of intracellular K (Flaminio and Rush, 1998). Thus, plasma K is not a valid measure of sweat K loss. Also, because dehydration increases Na absorption at the expense of K at the renal level, additional hypokalemia may occur throughout the exercise bout, independent of sweat losses. However, Kronfeld (2001c) suggests that in horses competing at speeds greater than 4 m/s, hyperkalemia, instead of hypokalemia, may actually be present during the exercise bout. He cites the work of Rose et al. (1977), Jansson et al. (1999), and Kingston et al. (1999) in providing evidence of increased potassium concentration during the course of exercise. However, it may be that these apparent increased concentrations are the result of fluid loss or fluid shifts from plasma.

Effects of Dehydration on Physiologic Parameters

Even as dehydration is apparent in horses exercised over long distances, it is important to examine the effect, if any, of such dehydration on physiological parameters. First, the effective decrease in plasma volume will likely affect additional heat dissipation in the animal. A linear relationship has been determined between water loss (as a percent decrease in body weight) and elevation in core temperature during exercise in humans (Sawka et al., 1985), while similar results have been obtained in the horse (Naylor et al., 1993). While some increase in core body temperature may be beneficial, fatigue has been identified in horses at core body temperatures approaching 42.5° C while muscle temperatures greater than 45° C may result in enzyme denaturing and protein catabolism (Guthrie and Lund, 1998).

Changes in plasma volume also affect cardiac output. Understandably, hypovolemia reduces stroke volume requiring a compensatory increase in heart rate to maintain cardiac output. At the same time, the circulatory and thermoregulatory systems are competing for blood flow. With a reduction in blood volume, the circulatory system vasoconstricts in an attempt to increase effective volume. To thermoregulate, however, the animal may also be attempting to vasodilate to allow additional blood flow to reach nearer the surface for heat dissipation. Such conflict may decrease time to fatigue and negatively influence exercise performance if blood flow to working muscle is compromised. At the same time, reduced plasma volume has also been implicated in pulmonary edema, peripheral edema, laminitis, and initiation of the blood clotting cascade (Foreman, 1998).

Metabolic alkalosis has been reported as an effect of prolonged endurance exercise. This is likely the result of depletion of K and Ca during exercise combined with the renal absorption of bicarbonate due to hypochloremia. Hypocalcemia may result in a lowering of the depolarization threshold, while hypokalemia may cause nerve hyper-excitability. Synchronous diaphragmatic flutter, or thumps as it is commonly referred, is the result of phrenic nerve hypersensitivity and results in contraction of the diaphragm in conjunction with atrial depolarization (Flaminio and Rush, 1998). Other associated conditions signaling an electrolyte disturbance and affecting performance may include paralysis of skeletal muscle, gastrointestinal hypomotility, and rhabdomyolosis or "tying up", and even atrial fibrillation.

Development of a combination of symptoms as a result of dehydration and exhaustion from prolonged endurance exercise has been dubbed the Exhausted Horse Syndrome (EHS) (Foreman, 1998). Signs of EHS include elevated temperature, pulse, and respiration; depression; dehydration; and unwillingness to continue exercise. Panting, synchronous diaphragmatic flutter, atrial fibrillation, colic, laminitis, and shock may also be present. While affected horses diagnosed and treated early generally recover, extreme cases may result in death.

Water Volume Regulation

Fluid volume in the horse is regulated through many overlapping systems, although the extent of such regulation may not be fully understood. First, stretch and pressure receptors are located through the vasculature, in the carotid sinus, and in the heart to detect hypo- and hypervolemia (hypertension). These receptors may be responsible for initiated hormonal signaling cascades. At the same time, change in osmolality is detected by osmoreceptors. The majority of osmoreceptors have been identified in the hypothalamus (Kronfeld, 2001b).

Antidiuretic hormone

Interaction of osmoreceptors and baroreceptors signaling hyperosmolality and hypovolemia, respectively, may result in the release of antidiuretic hormone

(ADH, also called vasopressin or arginine vasopressin). ADH is stored in the posterior pituitary gland and, when released, acts as a powerful vasoconstrictor aiding in the control of blood pressure during exercise. Elevations in ADH may also be responsible for initiating the thirst reflex, decreasing free water clearance from the liver, and influencing the uptake of water and electrolytes from the digestive tract (Kronfeld, 2001b).

McKeever and Hinchcliff (1995) report a curvilinear relationship between ADH concentration and exercise intensity. They suggest plasma ADH may increase from 0-4 pg/ml at rest to nearly 100 pg/ml with exercise speeds of 10 m/s. Submaximally exercised horses in the study showed a delayed response in ADH concentration, however, with increases occurring only after 20-40 minutes of exercise. The authors suggest ADH release may have been suppressed by other neural pathways or by increased atrial natriuretic peptide (ANP), responsible for vasodilation at the initiation of exercise.

Renin and Angiotensin

Renin is released by the juxtaglomerular apparatus in the kidney in response to hypotension, hyperkalemia, increased plasma catecholamines, or increased sympathetic activity via renal nerves (Kronfeld, 2001b). Renin may have some slight direct effect on renal function, and is responsible for the conversion of angiotensinogen into angiotensin I, which is then converted in the lung to angiotensin II. Angiotensin II then acts as a vasoconstrictor increasing blood pressure.

Like ANP, there is a correlation between exercise intensity and renin/angiotensin activity. McKeever et al. (1992) found angiotensin concentration (used as a measure of renin activity) to increase from 1.9 ng/ml/h at rest to 5.2 ng/ml/h at 9 m/s. Because renin activity paralleled heart rate, the authors proposed the increase was the result of increased sympathetic nervous system activity. During steady state exercise, then, angiotensin increased with the onset of exercise, but a later increase was attributed to decreased plasma Cl concentration as a result of sweat losses.

Renin and angiotensin may also increase post-prandially. Research by Clarke et al. (1988) indicates renin activity increases as much as three-fold after meal consumption in the horse. The authors suggest this may be the result of a hypovolemia as the result of salivary and pancreatic secretion, but likely benefits the animal by encouraging drinking behavior.

Aldosterone

Often grouped with renin and angiotensin, then collectively referred to as the renin-angiotensin-aldosterone system (RAAS), aldosterone is also a key player in fluid volume regulation. Aldosterone secretion can be stimulated by angiotensin II, but also by decreased plasma Na concentration, decreased blood pH, increased plasma K, or increased corticotrophin (McKeever, 1998). Aldosterone works primarily at the renal level, helping to regulate sodium reabsorption and thus helping to defend plasma volume through associated water reabsorption. At the same time aldosterone may help enhance absorption of water, sodium, and chloride absorption from the gut. Clarke et al. (1992) found horses subjected to short term exposure of aldosterone showed increased Na absorption in all regions of the colon.

Aldosterone has been shown to increase linearly with exercise intensity and parallel renin activity, increasing from around 50 pg/ml at rest to 190 pg/ml at 10 m/s (McKeever and Hinchcliff, 1995). With submaximal exercise, aldosterone concentration increases at a greater rate than that of renin/angiotensin. The authors suggest the increase in plasma K concentration often observed with endurance exercise may have been the trigger. Endurance exercised horses have also been shown to have prolonged elevation of aldosterone, often lasting hours after the completion of exercise. This likely serves as a benefit to help the animals in recouping total body water lost as a result of the exercise bout.

Aldosterone concentration may also be affected by meal consumption as well. Research indicates an increase in aldosterone in the horse with single and multiple meal feeding practices (Clarke et al., 1988). This may be the result of increased renin-angiotensin activity post-prandially or may be the result of high K^+ intake in the typical equine diet. Such a post-prandial increase in aldosterone, however, may benefit the dehydrated animal as water absorption would likely be increased along with Na in the colon, helping to restore body volume.

Techniques for Measuring Body Water and Fluid Shifts in the Horse

As previously mentioned, perhaps the simplest and most often employed method of measuring fluid loss in the horse is the measurement of body weight loss. Kingston et al. (1997b) suggest true fluid loss to be near 90% of body weight loss. Still, others have questioned the accuracy of such measurements, and care must be taken in reporting findings with regard to body weight loss from urine and/or feces. Furthermore, such measurement gives no indication as to where the fluid losses are originating be it intercellular or extracellular stores, and no insight into the resulting fluid shifts.

Other researchers have chosen to focus on the changes in total plasma protein concentration that accompany fluid loss in the horse (Nyman et al., 2002). In this method, change in plasma volume is simply estimated by the change in TP over time. As this method also provides little insight into fluid shifts, Nyman et al. (2002) also chose to examine plasma sodium concentration and plasma osmolarity to provide insight into such changes.

Other researches have chosen to employ indicator dilution techniques to measure plasma volume (Danielsen et al., 1995; Warren et al., 1999). The use of indocyanine green, a popular indicator of plasma volume for use in the horse, is described in detail by Parry et al. (1989). Others have chosen Evan's blue which has high affinity for serum albumin for similar dilution (Forro et al., 2000). Still, drawbacks to this method include the invasiveness of the technique and the need for sequential measurements to follow a time course of change in body water compartmentalization (Forro et al., 2000).

In addition to those used to measure plasma volume, other dilution techniques are available for use in the horse. According to Forro et al. (2000), the "gold standard" of these is tritiated water for determination of TBW. The major drawback to this technique, however, is the radioactivity associated with tritium. Perhaps, closest to this technique in terms of accuracy, however, is the use of deuterium oxide (D_20) dilution to measure TBW. First reported in the horse by Andrews et al. (1997), D_20 may be administered orally or infused into the jugular vein.

Finally, sodium thiocyanate (NaSCN) and sodium bromide (NaBr) have also been used via dilution to measure ECF volume (Carlson et al., 1979; Fielding et al., 2003). Unfortunately, NaSCN has been shown to bind rapidly to plasma proteins as well as enter cells, thus resulting in an overestimation of ECF. Sodium bromide, while having lower binding, requires equilibration time of up to 5 h, hindering its usefulness in some situations (Fielding et al., 2003). Utilizing techniques for determination of both TBW and ECF in tandem, however, allow for the estimation of intracellular fluid volume (ICF) by difference.

Perhaps most recently, researchers have investigated the use of a small, portable, noninvasive technique known as bioelectrical impedance analysis (BIA). Like many techniques in equine research, BIA was first used in human analyses. The basic principle is based on the idea that the electrical conductivity of the body will change depending on the amount of water and electrolytes present in the various body fluid compartments. Comparing BIA in the horse to other methods of body water measurement, Forro et al. (2000) determined BIA to be fairly consistent with other measurements in mature euhydrated horses. They suggest BIA may be helpful in accessing the magnitude of changes in total body water and extracellular fluid volume that occur as a result of exercise.

Gastrointestinal Tract's Role as a Reservoir

Water intake in the horse reflects the demands of secretion into the gastrointestinal tract (GIT), transport of dry matter through the GIT, dissolution of absorbed nutrients and transport to tissues, dissolution of substances for renal elimination, maintenance of body water compartments, and the export of heat via sweat and expiration (Coenen, 2005). At the same time, the water intake required to meet these needs is dependent upon several elements including composition of the diet and environmental factors. Total body water in the horse at rest is estimated to be around 662 mg/kg BW (Johnson, 1988). During dehydration, however, both total body water and distribution of water may vary.

As early as the 1970's, Argenzio et al. (1974) examined digesta passage and water exchange in the equine large intestine. Results of their study indicated that the large intestine could both store and (re)absorb large quantities of water, with the daily absorption being approximately equal to the animal's ECF space. At all times, fluid volume in the large intestine was 75% of total tract fluid volume. Eight hours after a meal, this fluid volume was approximately one-third of the total ECF.

Later, Meyer (1987) suggested the horse may be able to utilize water and electrolytes located in the digestive tract to attenuate dehydration. Given that the amount of fluid in the large intestine may be as high as 40 L depending on diet (Argenzio et al., 1974; Coenen, 2005), such a reservoir could potentially be quite useful.

Others, including Lucke and Hall (1978), question the horse's ability to draw on such a reserve given the possible distribution of blood flow away from the gut during exercise and in the period immediately following. This is further support by research into the blood flow distributions of ponies, where blood flow to the cecum was essentially half of resting when the ponies were subjected to 25 minutes of submaximal exercise (Duren, 1990). Yet, when ponies were fed prior to exercise, blood flow to the hind gut was greater with no reduction in blood flow to muscles of locomotion or respiration. No similar studies have attempted to examine blood flow during low-intensity, long-duration exercise in the horse. In humans, however, low-intensity exercise may actually improve gastric emptying (Marzio et al., 1991).

Still others question the efficiency of such a reservoir. Kronfeld (2001a) suggests that any benefit of additional water in the gut is outweighed by the additional water required metabolically to deal with the increased weight of such gut fill and additional resulting heat dissipation. He cites a study (Danielsen et al., 1995) in which horses consumed 5.32 kg of additional water when being fed a high hay diet. Plasma volumes in the horses were unchanged, however, and calculations by Kronfeld indicate the gain in water should be compared with the disadvantages of the water in terms of bowel ballast, which would further increase heat load. In the end, Kronfeld concludes a negative effect of the additional water consumed in response to the diet when looking at overall water balance. This concept can be further supported by the work of Nyman et al. (2002) who observed higher plasma lactate concentrations, indicative of decreased time to fatigue, in horses hyperhydrated with 12 L water prior to exercise.

The Effect of Diet on Water and Electrolytes

Correlation of water intake to dietary components

The effect of diet on water balance in the horse was examined as early as the 1940's when Leitch and Thomson (1944) associated water intake with dry matter (DM) intake. This was examined further by Fonnesbeck (1968) who found horses consuming 8.44 kg DM consumed 31.4 kg of water, while horses receiving similar diets containing only 7.64 kg of DM showed reduced water intake of 26.8 kg. In the same study, Fonnesbeck found no differences in water intake with varying protein concentrations as had been suggested previously. Perhaps surprisingly, the greatest correlation to water intake revealed by the Fonnesbeck study was that between ash content of the feed and water intake per unit of dry matter ($P< 0.01$, $R^2=0.65$).

Meyer (1995) also compared water content of the GI tact in ponies fed varying diets. After necropsy, he determined that in hay-fed and concentrate-fed ponies, 81% and 74% of total gut fill, respectively, was located in the large intestine. Continuing, Meyer determined this to be the result of water content, which was correlated again to DM intake. The correlation lines between DM intake and water consumption, however, were found to have different slopes for ponies fed hay and concentrate, indicating that an increase in the amount of hay fed would result a greater amount of water in the hind gut than a comparable amount of concentrate. Meyer attributed such a difference to a higher water holding capacity (WHC) of hay components.

Water holding capacity

Water holding capacity is the limit of a material's ability to take up and hold water. Investigations into differences in WHC of dietary fiber sources have been conducted by several researchers. For those feedstuffs commonly fed to horses, Bhatti and Firkins (1995) found alfalfa hay to have a greater WHC than orchard grass hay with 1.428 vs. 1.005 g H_20/g insoluble dry matter. Similarly, Wattiaux (1991) found the WHC of alfalfa to be greater than that of bromegrass, at 1.90 vs. 1.16 g/g insoluble fiber. In both the Bhatti and Firskins study and work conducted by Ramanzin et al. (1994), beet pulp ranked highest of common equine feedstuffs, at more than 6 g H_20/g insoluble dry matter.

Other researchers have attempted to identify the characteristics or compositions of forages which may be related to their WHC. Singh and Narang (1991) found WHC to be significantly correlated with NDF ($P < 0.01$), ADF ($P < 0.01$), hemicellulose ($P < 0.05$) and cellulose ($P < 0.01$) content, but not to lignin. Hyslop et al. (2003) reported a quadratic relationship to NDF was the greatest predictor of WHC (r^2= 0.81, $P < 0.001$) in common equine feeds. The predictive equation developed was:

$$\text{WHC (ml/g DM)} = 2.259 + (0.00261 \text{ X NDF}) + 0.00001316 \text{ X NDF}^2$$

Still others have correlated WHC to pectin concentration (McBurney et al., 1985). Lending support to this is the fact that pectin, a cell wall carbohydrate, is found in high amounts in beet pulp, and is higher in alfalfa than in grasses (Van Soest et al., 1991a). McBurney et al. (1985) further determined that WHC capacity was also linked to fermentability when a human fecal inoculum was utilized, and pectin, then, is highly fermentable. The authors suggest that such fermentability would allow the bound water to be available for absorption by the animal. This may suggest, then, that highly fermentable feeds may increase the availability of water to aid in attenuating dehydration in the endurance horse.

While Robertson and Eastwood (1981) agree that WHC is an important part of the affect of fiber type on diet and stool, they suggest that the amount of water held by a feedstuff may not be as important as how the water is held in determining the effects of fiber in the diet. They suggest water can be associated with fiber in one of three ways. First, water can be bound by the hydrophilic polysaccharides in the fiber. This water is unavailable and is dependent upon chemical composition of the fiber. Secondly, it can be bound within the structural matrix. Finally, the water can be trapped within the cell wall lumen. This trapped water is the most freely available. Thus, water holding capacity likely has more to do with fiber structure than chemical composition. This concept agrees with the relationship to fermentability observed by McBurney (1985).

Relationship of soluble fiber to water content and fermentability

When fiber is characterized not by crude fiber (CF) or neutral detergent fiber (NDF), but instead by the total dietary fiber (TDF) system (Van Soest, 1991), it can be divided into soluble (SDF) and insoluble (IDF) fractions. The soluble fraction, then, includes pectins, β-glucans, gums, mucilages, and some storage polysaccharides (polymers of arabonose, galactose, and mannose). Soluble fiber is both highly fermentable and has a greater WHC (Bhatti and Firkins, 1995; Ramanzin et al., 1994). Thus, as suggested by Danielsen (1995), the addition of increased amounts of soluble fiber in the feed would likely increase water content of the gut and perhaps be of benefit to horses subjected to prolonged exercise and resulting dehydration. As an added benefit, additional fermentation of soluble fibers should result in increased VFA production, which may also be of benefit to the animal as an energy source.

Effect of diet on electrolytes in the GI tract

At the same time, diet may influence electrolyte content of the GI tract. Meyer and Coenen (1989) observed the quantity of sodium in the large intestine of hay-fed ponies was more than twice that of their grain-fed counterparts (323 mg/ kg BW vs. 139 mg/kg BW). Potassium was also greater (201 mg/kg BW vs. 137 mg/kg BW) as was Cl (115 mg/kg BW vs. 47 mg/kg BW). It is important to recognize, however, that because water content of the large intestine was also greater, no differences in electrolytes were observed on a concentration basis. It may also be that the increase in electrolytes was the result of salivary, pancreatic, and other digestive secretions and thus may not represent a net gain in electrolytes even if absorbed. Still, a greater level of electrolytes in hay-fed animals may provide additional ions for absorption and replacement of those lost during exercise.

Oral electrolyte supplementation for endurance horses is common, however. Because electrolytes consumed over the animal's requirement are quickly excreted by the kidney, there appears to be no benefit to daily electrolyte loading over requirements (Schott and Hinchcliff, 1998). While administration prior to or during exercise may increase water intake (Nyman et al., 1996), the usefulness of such administration has been challenged. Whereas consumption of a hypotonic solution, such as plain water may increase hypotonic dehydration, ingestion of a hypertonic solution or hypertonic electrolyte paste may aid in the maintenance of plasma volume and help attenuate electrolyte deficiencies if consumed with adequate amounts of water. Or, it may be that administration of a hypertonic solution or an electrolyte paste, will result in flux of fluid into the gut, potentially further reducing plasma volume. Additionally, no performance advantage has been observed due to electrolyte administration, although a reduction in body weight loss has been observed (Dusterdieck et al., 1999). Perhaps most importantly, however, the sheer magnitude of electrolyte losses observed during prolonged endurance exercise would prove difficult to administer orally during the course of an exercise bout. Utilizing commercially available electrolyte mixes, for instance, would require the horse to consume more than 450 L to replace the ions lost during 3 hours of exercise (Schott and Hinchcliff, 1993).

Forage feeding in endurance athletes

Several researchers have utilized concepts of water holding capacity and fiber composition to investigate means of feeding fiber to horses for increased performance in endurance activities. The ideas were generally based on the gut reservoir concept suggested by Meyer (1987). Meyer and Coenen (1989) then tested their hypothesis on exercised ponies. Whereas water content was 183 ml/kg BW in non-exercised ponies, water content of the large intestine in ponies after exercise (1 hr at 3.3 m/s on a treadmill) was 138 mL/kg BW. After correcting for differences in intake, this suggests absorption of approximately 5 L over the course of the exercise bout. Extrapolating this to a 450-kg horse would suggest absorption of approximately 15 L (Schott and Hinchcliff, 1998). Na, Cl, and K contents were also reduced by this low-intensity exercise suggesting electrolyte absorption from the large intestine during exercise as well (Meyer and Coenen, 1989).

The concept of feeding endurance horses largely fiber-based diets can also be supported by the research of Clarke et al. (1990) who reported a 15% loss of plasma volume within 1 hour of feeding a grain meal as a result of salivary and pancreatic secretion. While such post-prandial changes in fluid balance may also occur in hay feeding, the response is attenuated.

As previous studies had examined the effect of grain feeding alone on plasma variables and exercise performance, Pagan and Harris (1999) attempted to determine the affect of forage feeding alone and with grain on such variables. In one experiment, horses were fasted, received 2.27 kg grass hay, had *ad libitium* access to grass hay, or were allowed free-choice grazing prior to a standard exercise test designed to approximate the speed and endurance test of a three-day event. Total protein in horses fed hay the morning of test was higher before and during exercise while HR was higher in horses that had *ad libitum* access to hay during the gallop portion of the standard exercise test (SET), which the authors attribute to movement of water from plasma to the gut. At the same time though, horses grazing prior to exercise, although heavier, did not suffer from lower plasma volume or increased HR, a fact the authors attribute to the grazing horses ability to better equilibrate fluid as pasture contains less cell wall, and would presumably have a lower water holding capacity.

Because of increased interest by both owners and feed companies in incorporating highly fermentable fibers into the diet of performance horses, a study by Crandell et al. (1999) compared one such fiber (sugar beet pulp) to both a traditional high grain diet and a fat-supplemented diet. Both the beet pulp and the soybean oil were substituted for a portion of the control grain so that the diets remained isocaloric on a DE basis. Horses were acclimated to each diet for 5 weeks before completing a SET. Results of this study indicated no differences in the ability of the horses to perform the SET as a result of the diets. HR was not different among treatments, nor was lactate, total protein, or packed cell volume. Interestingly, however, horses consuming the fat-supplemented diet tended to consume more water post-exercise (7.0 ± 0.8 L vs. 4.8 ± 1.1 L control or 4.7 ± 0.8 L high-fiber; $P < 0.10$). While the authors attributed this to the ability of the control and high-fiber feedstuffs to maintain a hindgut water reserve, this was not supported by a difference in total protein which would be expected if water balance differed among treatments.

Hypothesizing that more soluble fiber in the diet of performance horses would increase water in the gastrointestinal tract and that more water could in turn be absorbed during dehydration increasing plasma volume, Danielsen conducted several experiments at the University of Kentucky (Danielsen, 1995). Initially, horses were offered either a high-hay (6.1 ± 0.6 kg) or limited-hay (2.1 ± 0.2 kg) diet prior to a SET. While body weights of the horses were not different due to diet and horses lost an average of 4% body weight due to the SET, plasma total protein concentrations were greater ($P < 0.05$) in horses consuming the limited-hay diet suggesting greater dehydration in these horses compared to those consuming the high-hay diet. Again, this was attributed to the water-holding capacity of feedstuffs in the large intestine.

Following up on that experiment, Danielsen (1995) attempted to evaluate the effect of fiber type on water-availability from the hindgut. Four diets were fed, including a low fiber, high concentrate control and three high fiber diets. The high fiber diets were balanced for total dietary fiber, but varied in the amount of soluble fiber. The diet highest in soluble fiber contained 4.5 kg beet pulp, while the medium and low soluble fiber groups were developed with alfalfa and timothy hay. Frusemide was used to stimulate dehydration. Frusemide has been shown to decrease plasma volume to similar levels of dehydration as that of prolonged endurance exercise (Forro and Lindinger, 2006). Results of the Danielsen study show a trend ($P = 0.06$) for lower TP, indicating greater plasma volume, in the high soluble fiber diet 1-5 h post administration, with no difference during 0-1 h and 5-8 h. Plasma Na and Cl were not different due to diet.

Finally, Danielsen utilized both frusemide and exercise-induced dehydration in an attempt to further evaluate the effect of soluble fiber concentration. Two diets were utilized: a high-soluble fiber and low-soluble fiber. The high diet contained 7.8 kg alfalfa hay and 4.5 kg beet pulp, while the low diet contained 8.7 kg timothy hay, 2.4 kg oats, and 1.2 kg soybean meal. Diets were balanced for dry matter, DE, and total dietary fiber. Horses consumed each diet for 12 d before receiving frusemide and completing an SET. Prior to administration of frusemide, body weights were higher when horses consumed the high soluble fiber diets, perhaps as a result of higher water in the hindgut. Again, body weight loss was not different due to diet, but TP concentration was lower ($P < 0.01$) for the high soluble fiber diet. No differences were observed in Na, Cl, or K between diets, indicating that if water was being absorbed from the hindgut it was isotonic to plasma. In terms of performance, horses consuming the high soluble fiber showed a tendency for lower heart rates ($P < 0.10$), although rectal temperature tended to be higher when horses received the high soluble fiber diet ($P < 0.10$), although numerically the average difference was a mere 0.15° C.

Further expanding on the work of Danielsen, Warren et al. (1999) conducted a study utilizing three diets varying in total dietary fiber (TDF) or soluble fiber (SDF). The diets were high:high (high TDF, high SDF), high:low (high TDF, low SDF) and low:low (low TDF, low SDF). The high:high diet consisted mainly of beet pulp and alfalfa hay; high:low consisted of orchardgrass hay and an alfalfa-grass mixed hay; low:low was represented by orchardgrass and timothy hay along with oats. Dehydration was simulated by the use of frusemide. Horses were adapted to each diet for 10 days prior to furosemide administration. Contrary to the Danielsen studies (1995), horses consuming the high:high diet exhibited a greater loss of BW, although initial BW was higher. Plasma volume, as measured with indocyanine green, was not different due to dietary treatment. Total plasma protein was also unaffected by diet. The authors speculate that while the high:high diet may bind water more efficiently, such water may be unavailable as it may be difficult to "unbind".

Fat supplementation for the endurance athlete

The addition of dietary fat to the equine diet is a popular means for increasing caloric density while minimizing starch intake. Excessive starch intake has been implicated in numerous digestive and metabolic disorders in the horse including colic, laminitis, and equine metabolic syndrome. At the same time, several researchers have suggested performance benefits as a result of feeding diets high in fat. Shifts in substrate utilization from carbohydrate to fat during low- intensity exercise may prolong time to fatigue as well as preserve glycogen stores (Potter et al., 1992). This can be supported by research identifying an increase in non-esterified fatty acid (NEFA) supply to exercising muscle in horses subjected to low-intensity exercise (Orme et al., 1995). Correspondingly, a decrease in triacylglycerols and increase in lipoprotein lipase and total lipase activity has been identified (Orme et al., 1997).

Fat supplementation has been reported to increase resting glycogen stores in several studies (Meyers et al., 1987; Oldham et al., 1990; Scott et al., 1992), but this finding has not been substantiated by others (Hodgson et al., 1995; Orme et al., 1997; Pagan et al., 1987). Those showing an increase in resting stores also reported increased glycogen utilization during high-intensity exercise (Oldham et al., 1990; Scott et al., 1992).

Additionally, fat supplementation may increase oxidative capacity of muscle. Horses fed a diet containing 20% of DE from soybean oil for a 10-week period exhibited an increase in muscle citrate synthase and β-hydroxyl CoA dehydrogenase (Orme et al., 1997). This may result in lower heart rates and lower lactate concentrations observed by some researchers (Meyers et al., 1987).

As fat feeding in ruminants has been shown to reduce fiber digestibility, there is some concern that fat-supplemented diets may reduce fiber utilization in the horse as well (Jansen et al., 2000). Some researchers have reported that fat supplementation increased or did not affect fiber digestibility (Bush et al., 2001;

Davison et al., 1987; McCann et al., 1987). Others have reported a decrease in NDF digestibility (Rich et al., 1981; Worth et al., 1987). When dietary fat replaced an isoenergetic amount of carbohydrate in the diet of 6 mature horses, Jansen et al. (2000) reported a reduction in crude fiber, NDF, and ADF digestibility by 8%, 6.2%, and 8.3%, respectively.

Few studies have investigated the effect of fat supplementation on fluid and electrolyte status. Hoyt et al. (1995) supplemented Thoroughbred horses with 10% dietary fat and found no difference in fluid or electrolyte balance. Sweat production and composition was also unchanged during a SET. A similar study also showed no change in electrolyte balance or aldosterone response to fat supplemented horses exposed to exercise in a hot environment (Hower et al., 1995).

Although fat supplementation may benefit the endurance athlete in terms of substrate utilization, increased glycogen storage/availability, and increased oxidative capacity, potential downsides exist. If dietary fat does in fact reduce fiber digestibility, the fermentation of soluble fiber types and consequent release of water may be negatively impacted. At the same time, the caloric density of a fat supplemented diet may reduce the amount of forage consumed by the horse, which could reduce associated water and electrolyte availability within the reservoir of the hind-gut.

Given the differences in the results of studies examining the effect of dietary fiber and fat supplementation on water balance and resulting performance in the endurance horse, it is easy to see the only answer is that there remains no solid conclusion. It seems feasible that increasing the volume of fluid and electrolytes available to the horse in the hindgut may help maintain hydration in the face of prolonged endurance exercise. At the same time, combining soluble dietary fiber types with supplemental dietary fat may provide unique advantages to the equine endurance athlete in terms of both welfare and performance. Further research, then, is necessary to determine the physiological effects of various fiber types, with and without supplemental dietary fat, on the horse during long-distance exercise. With additional evidence, dietary recommendations can then be made which may help attenuate dehydration.

Chapter III

Hydration Status Before, During, and After Prolonged Endurance Exercise in Horses Fed Three Sources of Dietary Fiber

Summary

Water and electrolyte loss from prolonged endurance exercise may result in physiological disturbances in the horse. The large intestine has been suggested to serve as a water reservoir and may help attenuate dehydration. Dietary constituents may affect the amount of water held within the intestine and available for use by the horse. This study examined the hydration status of horses fed three dietary fiber types and subjected to a 60-km exercise test. After an initial training period and preliminary exercise test, horses were assigned to a replicated 3 x 3 Latin Square experiment. Diets were grass hay (G), 50:50 grass hay: alfalfa hay (GA), and 50:50 grass hay: proprietary chopped fiber mix (GM). Total body water (TBW) tended to be higher ($p < 0.08$) in horses consuming GA and GM than G (65.8 ± 0.8, 65.4 ± 0.8, and 63.9 ± 0.8%, respectively). Body mass (BM) due to diet was not different at the start of the exercise test, but when corrected for fecal loss and water intake showed a trend for diet difference during exercise ($p = 0.08$), decreasing more in GM than G (5.1 ± 0.4% vs. 3.4 ± 0.4%; GA 4.2 ± 0.4%). Heart rate was not different except at the end of bout one when the heart rate of GM was lower than G or GA ($p < 0.01$). Core body temperature, although not different at the start of the exercise test bout, was lower ($p < 0.05$) at the canter in horses consuming GM. Results suggest higher TBW in the GM diet at the initiation of exercise may have provided the horses with a greater "pool" of

available water for increased thermoregulation via sweating, allowing maintenance of a lower core body temperature during exercise but at the expense of increased BM loss. However, because the GM diet was higher in fat content, the increase in fat intake may have been responsible for the difference observed, thus further research is needed to distinguish between the effects of fat and fiber type.

Introduction

Maintenance of total body water during exercise requires balancing water intake with water loss. In the equine athlete, however, such balance rarely exists and dehydration is a common outcome of prolonged exercise as a result of sweat losses. In endurance horses in particular, sweat losses tend to be much greater than water intake even as the animals are commonly offered fluid and electrolytes during rest stops.

The equine large intestine has long been suggested to serve as a water reservoir and, as such, has been implicated in helping to attenuate dehydration. As early as 1974, Argenzio et al. examined digesta passage and water exchange in the large intestine. Results indicated that the large intestine could both store and (re)absorb large quantities of water, with the latter being approximately equal to the animals ECF space. Given that the amount of fluid in the large intestine may be as high as 40 L depending on diet (Coenen, 2005), such a reservoir could potentially be quite useful.

Others question the horse's ability to draw on such a reserve given the distribution of blood flow away from the gut during exercise and in the period immediately following (Duren et al., 1999; Lucke and Hall, 1980). Still others question the efficiency of such a reservoir. Kronfeld (2001a) suggests that any benefit of additional water in the gut is outweighed by the additional water required metabolically to deal with the increased weight of such gut fill and additional resulting heat dissipation.

More recent research has suggested that different dietary fiber types may possess different water holding capacities and thus may differ in their ability to release water within the hindgut. Research conducted by Danielsen et al. (1995) suggested that diets high in soluble fiber may result in less plasma volume loss during dehydration as evidenced by lower total plasma protein concentrations (TP). Contrary to the Danielsen study, a study by Warren et al. (1999) found horses consuming a diet high in soluble fiber exhibited a greater loss of BW, although initial BW was higher. Plasma volume was not different due to dietary treatment. Total plasma protein was also unaffected by diet. The authors speculated that while the diet may bind water more efficiently, such water may be unavailable as it may be difficult to "unbind".

This study was designed to determine the effects of three dietary fiber types on hydration during prolonged exercise and subsequent recovery. It was hypothesized that diets differing in fiber type would affect total body water (TBW) at rest and BM loss during exercise.

Materials and Methods

Horses and Preliminary Training

All experiments were approved prior to initiation by the Institutional Animal Care and Use Committee at Michigan State University. Six two-year-old Arabian geldings were obtained from the Michigan State University Horse Teaching and Research Center. After being adapted to handling, horses were conditioned to treadmill exercise for a twelve-week period. Training consisted of walking (1.6 m/s), trotting (4 m/s), and cantering (8 m/s) on the treadmill at increasing distances thrice weekly until the target of 60 km of endurance exercise per training bout could be met. More specifically, in weeks 1 and 2, horses were acclimated to the treadmill and walked and trotted for 5 km each session. During weeks 3 and 4, horses completed 10-km training bouts thrice weekly (consisting of walking, trotting, and cantering). Horses were then worked 15 km thrice weekly during weeks 5 and 6. During weeks 7 and 8, each horse completed one 30-km bout and four 15-km bouts. During weeks 9 and 10, horses completed one 45-km bout and four 15-km bouts. During weeks 11 and 12, horses were worked 15 km thrice weekly. At no time were horses worked at speeds greater than 8 m/s.

Diets and housing

During the initial training period, all animals had *ad libitum* access to a spring mixed-grass pasture. No supplemental feeds or minerals (including NaCl) were provided at any time during the study.

All horses then completed a preliminary exercise test (pasture diet, P) before beginning a replicated 3 x 3 Latin Square experiment, where each horse consumed each treatment diet for at least 14 d before completing a 60-km exercise test. During the Latin Square experiment horses were housed in groups of two in 9 x 14 m dry lots except during feeding. The treatment diets consisted of an all grass hay diet (G), a 50:50 grass hay: alfalfa hay (GA), and 50:50 grass hay: proprietary chopped fiber mix (GM) (Table 2). The proprietary fiber mix was formulated by Waltham Centre for Pet Nutrition (Leics, UK) to contain various fiber types known to be highly soluble and highly fermentable. Horses were initially offered 2.5% body weight daily, with amount offered reduced gradually to be just above voluntary intake from the previous feeding so as to reduce sorting and ensure a near 50:50 ratio in GA and GM diets. Feed was offered twice daily for a 4h period. For diet analyses, core samples of hays were taken from at least fifteen randomly selected bales and combined into a representative aliquot. Grab samples of fiber mix were obtained from 10 bags opened at random. Feed analyses were performed by Equi-Analytical (Ithaca, NY) using standard wet chemistry methods.

In-house analysis of particle size distribution (PSD) was performed on the chopped fiber mix portion of the GM diet. PSD was measured with a series of seven selected sieves (19 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 μm, 300 μm) and a pan, fitted into a sieve shaker (Model RX-86, W.S. Tyler Inc., Gastonia, NC). The sieve method was according to the ASAE Standards (2008). The analysis was performed in triplicate. The mass frequency (%) for material on each sieve was calculated and plotted against each particle size category. Geometric mean diameter (d_{gw}) and geometric standard deviation (S_{gw}) were calculated for each sieving replicate based on the formula described in the ASAE Standards (2008). Geometric mean diameter was 1.589 mm, while S_{gw} was 1.549.

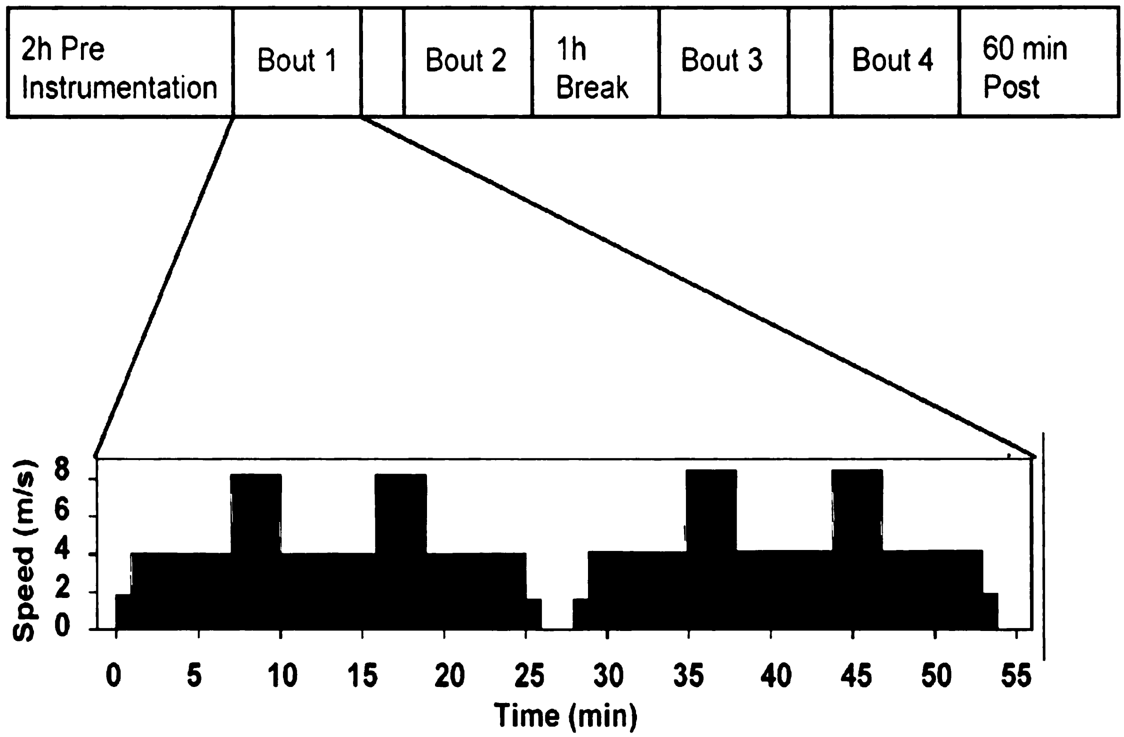
Exercise test

The 60-km exercise test used in this study and previously reported (Dusterdieck et al., 1999) was designed to replicate a competitive endurance ride. The test was divided into four 15-km bouts, each lasting 54 minutes and consisting of alternating walk (1.6 m/s), trot (4 m/s), and canter (8 m/s) (Figure 1).

Table 2. Analysis of diets fed to two-year-old Arabian horses to investigate the role of dietary fiber type on hydration status during prolonged endurance exercise (on a DM basis).

	Grass Hay (G)	Grass:Alfalfa (GA)	Grass:Fiber Mix (GM)
Dry Matter (%)	92.5	91.8	92.0
Crude Protein (%)	14.6	18.1	12.8
Lignin (%)	6.0	6.9	7.6
ADF (%)	34.5	33.0	37.1
NDF (%)	49.9	44.5	50.4
NFC (%)	24.0	26.6	22.3
Crude Fat (%)	2.9	2.9	7.7
Ash (%)	9.1	10.2	7.2
Ca (%)	0.77	1.12	0.76
P (%)	0.30	0.28	0.22
Mg (%)	0.21	0.23	0.21
K (%)	2.31	2.72	1.77
Na (%)	0.03029	0.03	0.03
Estimated DE (mcal/kg)	2.29	2.43	2.59

Figure 1. Exercise test design for 60-km stimulated endurance ride. Each of the four 15-km test bouts was identical and lasted 54 minutes. There was a 20-min break after Bout 1 and Bout 3.



Horses were allowed a two-minute rest period and offered water half-way through each bout. After completing the first and third bouts, horses were given a 20-min rest and water break; with a 1-h break with access to water and any remaining morning feed following bout 2.

Sample collection

On d 0, 7, and 14 of each treatment period, horses were weighed and blood was collected via jugular venipuncture in a 10-ml non-heparinized vacutainer, two 7-ml vacutainers with EDTA, and a 10-ml heparinized syringe. Tubes with EDTA were immediately centrifuged (1,340 x g for 10 min), while non-heparinized tubes were allowed to coagulate at 20° C prior to centrifugation. Plasma and serum samples were frozen at -20° C for later analysis.

Two hours prior to each exercise test, baseline blood samples were obtained, including an additional 10-ml vacutainer with lithium heparin additive, and horses were injected via left jugular catheter with deuterium oxide (D_2O) and sodium bromide (NaBr) for determination of TBW and ECF, respectively. 250 g NaBr (Sigma-Aldrich, St. Louis, MO) was dissolved in 1 L D_2O (Sigma-Aldrich, St. Louis, MO). The amount administered was determined by weighing the syringe before and after administration and averaged 63 g. The jugular catheter was then flushed with 20 cc heparinized saline before being removed. Blood was handled as previously described with the additional tube immediately centrifuged and resulting plasma frozen.

Horses were instrumented during each exercise test with telemetric electrocardiography and a Swan-Ganz catheter aseptically passed into the pulmonary artery to measure core body temperature and allow collection of mixed venous blood samples. Instrumentation occurred during the 2-h equilibrium time after D_2O/NaBr administration and the test was initiated after the 2-h blood samples were obtained, with an additional 10-ml lithium heparin tube for D_2O analyses. Body mass and core body temperature were measured and heart rate was recorded at the initiation and completion of each exercise bout, while mixed venous blood was obtained as previously described from the Swan-Ganz catheter. Heart rate and core body temperature were also recorded at consistent times during the trot and canter of the second half of each exercise bout.

Water intake during the test was recorded. When present, fecal and urine samples were weighed following each bout and representative samples collected for later analyses. Body mass loss was reported two ways. Uncorrected body mass loss was determined as the difference between the starting and ending weight divided by the start value. Body mass loss was also corrected for fecal and urine loss and water intake during the test and reported as corrected loss. This corrected loss would be equivalent to total fluid loss by the animal during the exercise bout through respiratory and sweat losses, independent of replacement.

Following completion of each exercise test, horses remained on the treatment diet for at least three days during which body weight and abdominal circumference were recorded and venous blood was sampled via jugular venipuncture daily.

Sample analyses

Serum was analyzed for packed cell volume (PCV) and total solids using microhaematocrit and refractrometry methods, respectively. The10-ml heparinized sample was used for determination of pH, blood gases, lactate, glucose, and electrolytes with an automated whole blood analyzer (Stat Profile M, Nova Biomedical, Waltham, MA). Aldosterone and cortisol were analyzed using the DSL-8600 Aldosterone Coated-Tube Radioimmunoassay kit and DSL-2100 Cortisol Coated-Tube Radioimmunoassay kit, respectively, obtained from Diagnostic Systems Laboratories (Webster, TX). Insulin was assayed using the Coat-A-Count Insulin radioimmunoassay kit by Siemens Medical Solutions Diagnostics (Los Angeles, CA). Non-esterified fatty acids and TG were analyzed colorimetrically using the HR Series NEFA-HR (2) kit and L-type TG H kit, respectively, obtained from Wako Diagnostics (Richmond, VA). All assays were performed according to the manufacturers' instructions.

Deuterium oxide and NaBr analyses for determination of TBW and ECF, respectively, were performed by Metabolic Solutions, Inc. (Nashua, NH) using an isotope ratio mass spectrometer and the method described by Scrimgeour et al. (1993).

Statistics

Baseline (pasture) results are provided for information only and are not included in statistical analyses. All data are presented as mean ± standard error. For the replicated Latin Square experiment, changes over time were assessed by two-way ANOVA, with repeated measures when appropriate. Diet and period differences were further separated using Tukey's mean separation test. Significance was defined as $p < 0.05$, while trends were considered when $p < 0.10$.

Results

Feed intake

Feed intake as a percent of body weight increased over the course of the study ($p < 0.001$). Intake averaged 1.58 ± 0.07%, 2.14 ± 0.07%, and 2.44 ± 0.07%, in periods 1, 2, and 3, respectively. Intake was also different by diet ($p < 0.01$); GA (2.25 ± 0.07%) was greater than both G (1.91 ± 0.07%) and GM (2.01 ± 0.07%).

Day 0 and Day 7

No differences in body weight, blood pH, PCV, TS, K, Cl, Ca, blood glucose, or blood lactate were observed between diets or periods on d 0. Period differences were observed for Na, Mg, BUN, and OSM. Na was greater ($p < 0.05$) in period 3 (139.2 ± 0.5 mmol/l) than 1 or 2 (137.0 ± 0.5, 137.0 ± 0.5, respectively). Mg was greater ($p < 0.01$) at the start of period 1 (1.20 ± 0.03 mg/dl) than 2 (1.10 ± 0.03 mg/dl) or 3 (1.03 ± 0.03 mg/dl). BUN ($p < 0.05$) was also greater at the start of period 1 at 22.7 ± 1.4 mg/dl compared to 15.8 ± 1.4 and 16.6 ± 1.4 in periods 2 and 3, respectively. OSM was greater ($p < 0.05$) during period 3 (279 ± 1 mOsm/kg) than period 2 (275 ± 1 mOsm/kg) and not different from either value in period 1 (278 ± 1 moSm/kg).

After seven days (d 7), Na remained greater ($p < 0.05$) in period 3 than 1 or 2 (139.3 ± 0.6, 137.0 ± 0.6, and 136.4 ± 0.6 mmol/l, respectively). Total ionized Ca was greater in period 1 than 2 or 3 ($p < 0.05$; 6.4 ± 0.1, 6.1 ± 0.1, 5.9 ± 0.1 mg/dl). Blood glucose exhibited a diet difference ($p < 0.01$) being greater for GM (109.1 ± 1.5 mg/dl) than G (103.9 ± 1.5 mg/dL) or GA (101.4 ± 1.5 mg/dL), as well as a period difference ($p < 0.05$) being greater in period 1 than 2 or 3 (110.8, 101.8, and 101.9 ± 1.5 mg/dl, respectively). BUN also exhibited a diet effect ($p < 0.001$) being lower in GM (13.8 ± 0.5 mg/dL) compared to G (17.6 ± 0.5 mg/dl) or GA (18.0 ± 0.5 mg/dL) and a period effect ($p < 0.01$) with all periods being different at 17.6, 15.2, and 16.6 ± 0.5 mg/dl for period 1, 2, and 3, respectively. OSM displayed the same period effect ($p < 0.05$) as d 0, with period 3 (280 ± 1 mOsm/kg) being greater than period 2 (274 ± 1 mOsm/kg) while period 1 (276 ± 1 moSM/kg) was not different from either value.

Body Fluids

Total body water for horses consuming pasture was 62.2 ± 0.8%. In the Latin Square experiment, total body water as a percentage of BM at rest tended toward significance for a diet difference ($p = 0.08$, Table 3). Both GA and GM were greater than G at 65.8 ± 0.1%, 65.4 ± 0.1%, and 63.9 ± 0.1%, respectively.

Table 3. Total body water (TBW), extracellular fluid volume (ECF), and intracellular fluid volume (ICF) in six horses fed diets consisting of grass hay (G); grass and alfalfa hay (GA); or grass and a soluble fiber mix (GM).

	G	GA	GM	SEM
TBW / BM	0.639[a]	0.658[b]	0.655[b]	0.009
ECF / BM	0.233	0.251	0.240	0.018
ECF / TBW	0.363	0.390	0.365	0.025
ICF / BM	0.407	0.394	0.416	0.018
ICF / TBW	0.637	0.612	0.636	0.025

[ab] Values within a row lacking common superscripts differ ($p = 0.08$)

Figure 2 shows TBW as a percentage of BM for individual animals. ECF as a percentage of BM or as a percentage of TBW was not different by diet ($p = 0.88$, $p = 0.74$, respectively) at 24.1 ± 1.8% of BM and 37.2 ± 2.5% of TBW. ICF, calculated by difference, was also not different by diet or period.

Body Mass

Uncorrected body mass loss during the pasture exercise test averaged 3.9 ± 1.1%. Differences in body mass due to diet were not present at the start of the exercise bout. Uncorrected body mass loss was 2.7 ± 0.5% and was not different by diet ($p = 0.25$) or period ($p = 0.74$). When corrected for fecal and urine losses and water intake, BM loss (as a representation of sweat loss) showed a trend for diet difference during exercise ($p = 0.08$), decreasing more in GM than G (5.1 ± 0.4% vs. 3.4 ± 0.4%; GA 4.2 ± 0.4%; Figure 3).

Water intake

Water intake during the course of the exercise test was not different by diet ($p = 0.8$), but was greater during the second half of the test than the first (7.8 ± 0.7 l, 4.2 ± 0.7 l, respectively). Water intake during the duration of the exercise test averaged 11.4 ± 1.5 l.

Figure 2. Total body water as a percentage of body mass in six horses fed diets consisting of grass hay (G); grass and alfalfa hay (GA); or grass and a soluble fiber mix (GM).

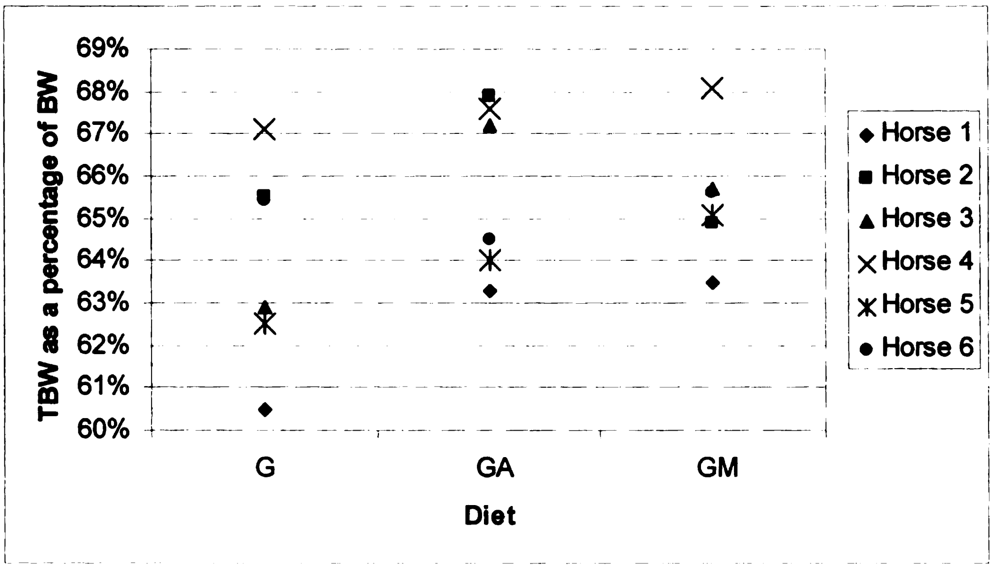
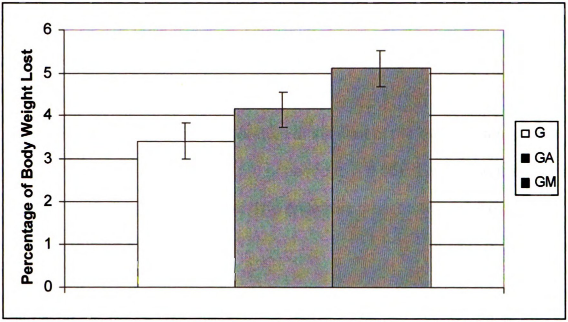


Figure 3. Percentage of body weight lost during a 60-km exercise test in horses fed diets consisting of grass hay (G); grass and alfalfa hay (GA); or grass and a soluble fiber mix (GM) when corrected for fecal and urine loss and water intake. P = 0.08; GM > G.



Body Temperature

Core body temperature across all times displayed a diet*period interaction. In periods 1 and 2, no difference by diet was observed; however, during period 3, GM (37.1 ± 0.3° C) was lower ($p < 0.001$) than G or GA (39.3 ± 0.3, 39.4 ± 0.3° C, respectively).

Comparing core body temperature at the start of the exercise tests, there were no differences by diet ($p = 0.59$) or period ($p = 0.86$). Examining the canter portion of each exercise test, a diet difference was present across all exercise test bouts (Figure 4).

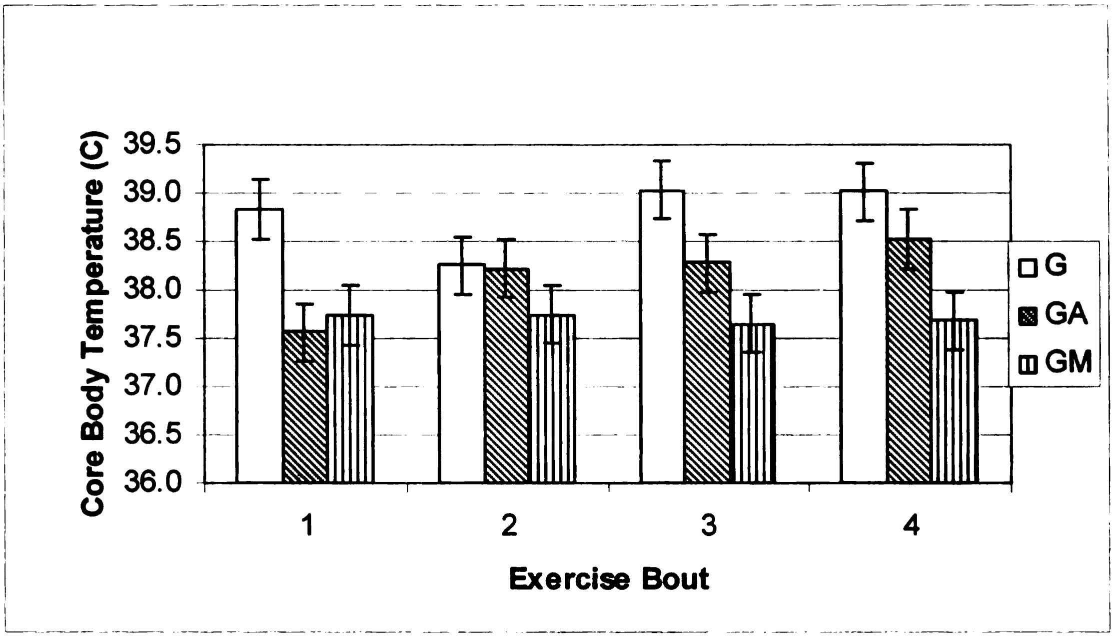
Heart Rate

Heart rate exhibited a diet*time interaction ($p < 0.05$), although further analysis indicated a difference between diets only at the end of exercise bout 1 ($p < 0.001$) when GM (69.7 ± 3.3 bpm) was less than G (87.9 ± 2.8 bpm) or GA (88.5 ± 3.3 bpm).

Blood parameters

Total solids were different by diet ($p < 0.01$), where GA (6.73 ± 0.06 g/dl) was greater than GM (6.58 ± 0.05 g/dl) which was greater than G (6.45 ± 0.05 g/dl). PCV was not different by diet but was greater ($p<0.05$) in period 1 (34.9 ± 0.4%) than period 2 (33.4 ± 0.4%) or 3 (32.4 ± 0.5%). Blood glucose concentration was higher ($p < 0.01$) across all times with GM (134 ± 4 mg/dl),

Figure 4. Core body temperature during the canter portion of a 60-km exercise test, split into four test bouts, in horses consuming diets consisting of grass hay (G); grass and alfalfa hay (GA); or grass and a soluble fiber mix (GM). ($p < 0.05$, GM < G).



than with G (123 ± 4 mg/dl) or GA (123 ± 4 mg/dl). PO_2, PCO_2, pH, Na, K, Cl, Ca, and Mg were not different due to diet during the exercise test. Blood lactate concentration increased over the course of the exercise test ($p < 0.01$), but did not exhibit a diet effect.

Hormones

Insulin exhibited only a time effect ($p < 0.05$; Table 4). Aldosterone was not different by diet or period but exhibited a time difference. Aldosterone was higher ($p < 0.01$) at the end of the exercise test (72.4 ± 7.9 pg/ml) than at the start (40.0 ± 7.2 pg/ml) or 1 d post (22.8 ± 7.9 pg/ml). Cortisol was different by period ($p < 0.05$), with period 1 (2.52 ± 0.16 µg/dl) being lower than period 2 (3.02 ± 0.16 µg/dl) or period 3 (3.00 ± 0.16 µg/dl). Cortisol also demonstrated a time difference (Table 5).

NEFA and TG

NEFA were not different due to diet, but exhibited a period*time interaction (Table 6). TG exhibited a diet difference ($p < 0.001$), being lower in GM than G or GA (32.4 ± 3.1, 49.6 ± 2.5, and 51.1 ±3.1 mg/dl, respectively). TG also exhibited a time effect (Table 5).

Table 4. Insulin (μIU/ml) in horses completing a 60-km exercise test.

2 h Pre	Start B1	Start B3	60 min Post	1 d Post	SEM
2.5^{a}	8.4^{c}	8.2^{c}	5.8^{bc}	3.1^{ab}	1.4

^{abc} Values within a row lacking common superscripts differ ($p < 0.05$)

Table 5. Cortisol (μg/dl) and TG (mg/dl) in horses completing a 60-km exercise test.

	Start B1	End B2	Start B3	End B4	1 d Post	SEM
Cortisol	2.64^{b}	4.33^{c}	2.69^{b}	3.70^{c}	0.88^{a}	0.22
TG	54.0^{b}	45.6^{b}	47.9^{b}	42.2^{ab}	32.0^{a}	4.2

^{abc} Values within a row lacking common superscripts differ ($p < 0.05$)

Table 6. NEFA (mEq/l) in horses completing a 60-km exercise test.

Period	Start B1	End B2	Start B3	End B4	1 d Post	SEM
1	0.6708^{ab}	1.0707^{b}	0.5268^{a}	0.9776^{b}	0.3657^{a}	0.099
2	0.3252^{a}	0.8412^{b}	0.5630^{a}	1.2165^{c}	0.4854^{a}	0.099
3	0.2193^{a}	0.7181^{b}	0.3418^{a}	1.1963^{c}	0.3073^{a}	0.113

^{abc} Values within a row lacking common superscripts differ ($p < 0.05$)

Discussion

Total body water was similar to that reported by Andrews et al. (1997) using deuterium oxide dilution. As hypothesized, TBW as a percentage of BM tended to be greater in GA and GM, possibly as a result of different fiber types. For example, Danielsen et al. (1995) suggested diets higher in soluble fiber content may result in less plasma volume loss during dehydration. The differences observed in TBW may be related to the water holding capacity of the different fiber types. For those feedstuffs commonly fed to horses, Bhatti and Firkins (1995) found alfalfa hay to have a greater WHC than orchard grass hay with 1.428 vs. 1.005 g H_20/g insoluble dry matter. Other researchers have attempted to identify the characteristics or compositions of forages which may be related to their WHC. Singh and Narang (1991) found WHC to be significantly correlated with NDF ($p < 0.01$), ADF ($p < 0.01$), hemicellulose ($p < 0.05$) and cellulose ($p < 0.01$) content, but not to lignin. Still others have correlated WHC to pectin concentration (McBurney et al., 1985). Lending support to this is the fact that pectin, a cell wall carbohydrate, is found in high amounts in beet pulp, and is higher in alfalfa than in grasses (van Soest et al., 1991b). McBurney et al. (1985) also determined that WHC capacity was also linked to fermentability when a human fecal inoculum was utilized. The authors suggest that such fermentability would allow the bound water to be available for absorption in the animal. In this experiment, then, we could expect both GA and GM to have both increased pectin concentration and greater fermentability which may have resulted in the greater TBW observed.

Interestingly, TBW was numerically greater in all hay diets than in the same horses when allowed free-choice access to pasture. This may have been the result of a training effect, as all horses consumed the pasture diet and completed the pasture exercise test prior to completing the Latin Square experiment and training induced hypervolemia has been reported in the horse (McKeever et al., 1987). As water intake was not measured during the diet consumption period, it may have also been that pasture horses drank less.

ECF and ICF were within normally reported ranges (Lindinger et al., 2004). The lack of a difference observed in ECFV due to diet may be the result of greater subject variability in the NaBr dilution technique. Fielding et al. (2003) have suggested NaBr use in the horse may require an equilibration period of up to 5h whereas we allowed only 2h; thus greater equilibration may have resulted in less variable results. Alternatively, it may be that greater TBW may not correlate to an increase in ECFV and may instead represent greater intracellular stores.

Unlike our hypothesis, we observed a trend for BM loss to be greatest in GM. Warren et al. (1999) also observed a greater loss of bodyweight in horses consuming a diet high in both total and soluble fiber when compared to lower fiber diets. Comparing the hay diets to pasture, overall body mass loss was reduced when horses consumed all hay diets, however, again this may be a training effect.

Water intake during the exercise test was highly variable among horses, but did not differ by diet, although water intake during the diet adaptation period prior to the test was not measured. Increased water intake has been observed in horses consuming increased total dietary fiber (Warren et al., 1999) as well as increased DM (Fonnesbeck, 1968).

The diet*period interaction observed for core body temperature across all times, with lower temperatures in GM, may be related to increased feed intake in the third period. Digestion of diets G and GA may have resulted in increased heat of fermentation when compared to GM; but, had this occurred, we would have expected a difference in core body temperature at the start of the exercise test. Instead, core body temperature during the start of the exercise bout was not different by diet.

Core body temperature during the canter portion of the exercise tests, however, was lower in GM though all periods. While the difference averaged one degree Celsius, this may be physiologically significant when considering the prolonged duration of endurance exercise. One explanation of this diet difference may be that the increased fat content of the GM diet was responsible for differences in body temperature. Fat-supplementation has been reported to reduce thermal load likely by reducing fermentation within the digestive system (Scott et al., 1992).

Increased fat content in GM may also be responsible for increased blood glucose concentration over the course of the exercise test. Blood glucose was increased in horses consuming GM as early as 7 days after starting the diet, perhaps indicating a metabolic shift towards fat-utilization. Complete fat adaptation in the horse, however, has been reported to take as long as 21 d (Potter et al., 1992).

Decreased TG in horses consuming GM may also contribute to a potential effect of additional dietary fat. A decrease in TG has been reported in other studies investigating fat feeding in horses and is generally considered to be indicative of increased fat utilization during exercise (Geelen et al., 1999; Orme et al., 1997). We did not, however, see an increase in NEFA during the course of the exercise bout, in contrast to previous reports (Orme et al., 1995).

Given the relatively short diet adaptation period and that total fat content in GM, while greater than G or GA, remained less than 8%, differences observed in TG may have also been related to fiber type. Feeding highly fermentable, soluble fibers to hamsters has been shown to lower TG concentrations (Terpstra et al., 1998). Horses fed beet pulp, known to be high in pectin, at 25% of the diet showed lowered TG in the fasting state, as well as increased NEFA (Hallebeek and Beynen, 2003). Thus, the decrease in TG in this study may not be attributable, or entirely attributable, to dietary fat supplementation and may instead be an effect of dietary fiber type.

Little difference in HR over the course of the exercise test was observed as a result of diet. At the end of exercise test bout 1 only, GM was substantially lower (> 17 bpm, taken at the walk) than G or GA. As horses were generally excitable and reactive on the treadmill during the first exercise test bout, this may be the result of less excitability in horses consuming GM. Horses consuming fat-supplemented diets have been reported to be less reactive to external stimulus (Holland et al., 1996).

It is also important to point out that the fiber mix portion of the GM diet was a chopped mix. Thus, differences observed in regard to this diet may be related to fiber length. Chopped fiber would be expected to have greater surface area and therefore be more readily fermented by the horse than longer-stemmed roughage.

While additional fat provided by the GM diet or the chopped nature of the fiber mix may have been responsible for some differences observed, we suggest dietary fiber type may have been responsible for others. Specifically, it may be that higher TBW in the GM diet at the initiation of exercise may have provided the horses with a greater “pool” of available water that could be utilized for increased thermoregulation via sweating, allowing maintenance of a lower core body temperature as observed during the canter phase of the exercise test. The horse exhibits a priority for thermoregulation over water balance, as evidenced by heavy sweating rates in horses at the expense of fluid, electrolyte, and body mass loss. This idea of increased water availability for thermoregulation could also be supported by Warren et al. (1999) who found horses on a high soluble fiber diet exhibited a greater loss of body mass yet were able to maintain plasma volume, when dehydrated with frusemide.

Further research into the effect of dietary fiber type, without the potentially confounding effect of fat supplementation and fiber length, should provide additional insight into water balance in the exercising horse.

CHAPTER IV

Evidence for a role of dietary fiber type, not fat supplementation, on the hydration status of endurance horses

Summary

The equine large intestine has been suggested to serve as a water reservoir during prolonged endurance exercise; the extent or effectiveness of which may be influenced by dietary fiber type. At the same time, fat supplementation may result in performance and possibly hydration advantages to the endurance athlete. This study, then, was designed to examine the effect of dietary fiber type on hydration status, with and without fat supplementation. In a randomized incomplete block design, six two-year-old Arabian horses were randomly assigned to diets containing either chopped grass hay (G) or a chopped grass hay: soluble fiber mix (GM) and either fat supplementation (Ft) or no fat supplementation (NFt). All horses consumed each diet for a period of at least 21 d before completing a 60-km exercise test. Total body water, as determined using D_2O, was 66.1% of body mass and did not differ due to treatment. Horses consuming GM had greater ($p < 0.05$) body mass at the start of exercise than those consuming G. Water consumption during the exercise test was greater in G than GM ($p < 0.01$; 13.3 ± 1.3 L, 10.9 ± 1.3 L), as were PCV ($p < 0.01$; G 36.8 ± 1.2, GM 35.1± 1.2) and plasma aldosterone across all times ($p < 0.001$; GM 28.4 ± 3.8 pg/ml, G 53.3 ± 3.8 pg/ml). The results suggest that fiber type plays a greater role in hydration status than does fat supplementation.

However, in comparison to a previous study, a higher TBW and lower core body temperature during exercise in this study may suggest that the chopped nature of the fiber may benefit the animal and thus may merit further investigation.

Introduction

Dehydration is a common result of prolonged endurance exercise in the horse despite frequent access to feed and water during the course of the exercise bout. Fluid and electrolyte losses equating to as much as 7 to 9% of body weight can be expected to result in adverse physiological effects in the horse, including death in extreme cases (Snow et al., 1982). While initial research focused on the quantity of fluid and electrolyte loss and means of replacement, more recent research has suggested dietary interventions may help attenuate such exercise-induced dehydration in endurance horses. More specifically, the large intestine may serve as a water and electrolyte reservoir capable of holding more than 40 L of fluid, depending upon diet (Coenen, 2005).

While different dietary fiber types are known to possess different water holding and releasing capacities, only a few studies have investigated the effect of dietary fiber type on hydration status in horses. Danielsen et al. (1995) examined changes in body weight and plasma volume in horses fed varying levels of soluble fiber. While body weight loss was not different between diets, the authors suggested reduced TP concentration was indicative of greater plasma volume in horses fed the high soluble fiber diet. Other research indicated greater body weight loss, albeit with maintenance of plasma volume, in horses fed diets high in soluble fiber (Warren et al., 1999).

We have previously demonstrated differences in hydration status and physiological parameters in horses fed three dietary fiber types (Spooner, Chapter III Dissertation). Horses consuming a grass hay: chopped soluble fiber mix diet or grass hay: alfalfa hay diet had greater TBW at rest than horses consuming only grass hay. Horses consuming the grass hay: chopped soluble fiber mix diet, while showing a tendency for greater body mass loss, also maintained a lower core body temperature at the canter. Thus, we have suggested that diets containing chopped soluble fibers may provide the animal with a greater "pool" of available water for increased thermoregulation via sweating, allowing maintenance of a lower core body temperature during exercise but at the expense of increased BM loss. However, in our study, differences in fiber type were confounded with greater fat content of the diet containing the chopped soluble fiber mix as well as fiber length (chopped vs. long-stemmed).

Thus, this study has been designed to examine the effect of dietary fiber type, fat supplementation, and any interaction between the two on hydration status in endurance horses. We hypothesize that dietary fiber type, but not fat supplementation, will result in differences in total body water at rest and body mass loss during exercise. Further, it is expected that differences in fuel utilization during exercise, as examined by blood glucose, NEFA, and TG will be attributable to fat supplementation.

Materials and Methods

Horses and Preliminary Training

All experiments were approved prior to initiation by the Institutional Animal Care and Use Committee at Michigan State University. Six two-year-old Arabians, three geldings and three fillies, were obtained from the Michigan State University Horse Teaching and Research Center. After being adapted to handling, horses were conditioned to exercise on a high-speed treadmill and free-flow mechanical exerciser for a twelve-week period. Training consisted of walking (1.6 m/s), trotting (4 m/s), and cantering (8 m/s) at increasing distances thrice weekly until the target of 60 km of endurance exercise in a single day could be completed. More specifically, in weeks 1 and 2, horses were acclimated to the treadmill and walked and trotted for 5 km each session. During weeks 3 and 4, horses completed 10-km treadmill training bouts thrice weekly (consisting of walking, trotting, and cantering). Horses were then worked 15 km thrice weekly during weeks 5 and 6. During weeks 7 and 8, each horse completed one 30-km bout on the treadmill and four 15-km bouts on the free-flow mechanical exerciser. During weeks 9 and 10, horses completed one 45-km treadmill bout and four 15-km exerciser bouts. During weeks 11 and 12, horses were worked 15 km thrice weekly. At no time were horses worked at speeds greater than 8 m/s.

Diets

During the initial training period, all animals had *ad libitum* access to a spring mixed-grass pasture. No supplemental feeds or minerals (including NaCl) were provided at any time during the study.

At the conclusion of the training period, horses were removed from pasture and randomly assigned to the first of four treatment diets. Each horse would complete a 60-km exercise test after consuming each diet for at least 21 d. The treatment diets consisted of two factors, fiber type and fat supplementation. The fiber types were either a grass hay (G) or a 50:50 ratio of grass hay to soluble fiber mix (GM). Fat was either supplemented (Ft) or not (NFt) for a total of four treatments (Table 7). Because of the fat supplementation two proprietary soluble fiber mixes were formulated by Waltham Centre for Pet Nutrition (Leics, UK). The fiber mixes were identical in terms of dietary fiber type, with slight differences in formulation to account for fat-supplementation in order to keep the diets more nearly isocaloric. Both the grass hay and the fiber mixes were prepared as chopped fibers to avoid any effect of fiber length. For the hay diet with supplemental fat (G:Ft), soybean oil was weighed separately, added immediately prior to feeding at a rate of 0.04% of hay feed, and mixed thoroughly with the ration. Horses were initially offered 2.5% body weight daily, split into two equal feedings, with amount offered adjusted as necessary to be just above voluntary intake from the previous feeding so as to reduce sorting. Diets were individually offered in stalls for 4 h for each feeding, and horses were group-housed during the remaining hours in a 14 x 27 m dry lot.

Table 7. Analysis of diets (on percent DM basis) fed to horses to investigate the effects of dietary fiber type and fat supplementation on hydration status and physiological parameters. G = grass hay; GM = grass hay: soluble fiber mix; NFt = no supplemental fat; Ft= supplemental fat.

	G:NFt	G:Ft	GM:NFt	GM:Ft
DE, mcal/kg	1.83	2.20	2.22	2.24
Crude Protein	10.8	10.8	13.3	12.8
Lignin	9.0	9.0	7.8	7.5
ADF	48.1	48.1	35.2	35.5
NDF	68.3	68.3	54.3	53.6
ESC (Simple Sugars)	5.2	5.2	6.8	5.3
Starch	0.4	0.4	8.9	7.8
Non Fiber Carbohydrates (NFC)	11.4	11.4	24.3	25.6
Crude Fat	1.7	5.7	3.2	5.8
Ash	7.8	7.8	7.4	7.2
Ca	0.40	0.40	0.63	0.58
P	0.22	0.22	0.37	0.37
Mg	0.14	0.14	0.21	0.20
K	2.76	2.76	2.01	1.96
Na	0.01	0.01	0.09	0.07
Cl	0.89	0.89	0.64	0.64

Feed intake was recorded as feed offered minus feed refused for each meal, but was analyzed by day. Individual water intake was recorded on d 17 of each period by confining horses to stalls for a period of 24 h and measuring intake from a graduated 12 L bucket.

For diet analyses, core samples of hays were taken from at least fifteen randomly selected bales prior to chopping and combined into a representative aliquot. Grab samples of the fiber mixes were obtained from 10 bags of each opened at random. Feed analyses were performed by Equi-Analytical (Ithaca, NY) using standard wet chemistry methods.

In-house analysis of particle size distribution (PSD) was performed on the chopped fiber mix portion of the GM diet. PSD was measured with a series of seven selected sieves (19 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm) and a pan, fitted into a sieve shaker (Model RX-86, W.S. Tyler Inc., Gastonia, NC). The sieve method was according to the ASAE Standards (2008). The analysis was performed in triplicate. The mass frequency (%) for material on each sieve was calculated and plotted against each particle size category. Geometric mean diameter (dgw) and geometric standard deviation (Sgw) were calculated for each sieving replicate based on the formula described in the ASAE Standards (2008).

Exercise test

The 60-km exercise test used in this study and previously reported (Dusterdieck et al., 1999) was designed to replicate a competitive endurance ride. The test was divided into four 15-km bouts, each lasting 54 minutes and consisting of alternating walk (1.6 m/s), trot (4 m/s), and canter (8 m/s) (Figure 1). Horses were allowed a two-minute rest period and offered water half-way through each bout. After completing the first and third bouts, horses were given a 20-min rest and water break; with a 1-h break with access to water and any remaining morning feed following bout 2.

Sample collection

On d 0, 7, and 14 of each treatment period, horses were weighed and blood was collected via jugular venipuncture in a 10-ml non-heparinized vacutainer, two 7-ml vacutainers with EDTA, and a 10-ml heparinized syringe. Tubes with EDTA were immediately centrifuged (1,340 x g for 10 min), while non-heparinized tubes were allowed to coagulate at 20° C prior to centrifugation. Plasma and serum samples were frozen at -20° C for later analysis.

Two hours prior to each exercise test, baseline blood samples were obtained, including an additional 10-ml vacutainer with lithium heparin additive, and horses were injected via left jugular catheter with deuterium oxide (D_2O) for determination of TBW. The amount administered was determined by weighing the syringe before and after administration and averaged 60 g. The jugular catheter was then flushed with 20 cc heparinized saline before being removed. Blood was handled as previously described with the additional tube immediately centrifuged and resulting plasma frozen.

Horses were instrumented during each exercise test with telemetric electrocardiography and a Swan-Ganz catheter aseptically passed into the pulmonary artery to measure core body temperature and allow collection of mixed venous blood samples. Instrumentation occurred during the 2-h equilibrium time after D_2O administration and the test was initiated after the 2-h blood samples were obtained, with an additional 10-ml lithium heparin tube for D_2O analyses. Body mass and core body temperature were measured and heart rate was recorded at the initiation and completion of each exercise bout, while mixed venous blood was obtained as previously described from the Swan-Ganz catheter. Heart rate and core body temperature were also recorded at consistent times during the trot and canter of the second half of each exercise bout, while an additional mixed venous blood sample was obtained during the final canter of each exercise bout.

Water intake during the test was recorded. When present, fecal and urine samples were weighed following each bout and representative samples collected for later analyses. Body mass loss was reported two ways. Uncorrected body mass loss was determined as the difference between the starting and ending weight divided by the start value. Body mass loss was also corrected for fecal and urine loss and water intake during the test and reported as corrected loss. This corrected loss would be equivalent to total fluid loss by the animal during the exercise bout through respiratory and sweat losses, independent of replacement.

Following completion of each exercise test, horses remained on the treatment diet for at least three days during which body weight and abdominal circumference were recorded and venous blood was sampled via jugular venipuncture daily.

Sample analyses

Blood was analyzed for packed cell volume (PCV) and total solids (TS) using microhaematocrit and refractrometry methods, respectively. The 10-ml heparinized sample was used for determination of pH, blood gases, lactate, glucose, and electrolytes with an automated whole blood analyzer (Stat Profile M, Nova Biomedical, Waltham, MA). Aldosterone and cortisol were analyzed using the DSL-8600 Aldosterone Coated-Tube Radioimmunoassay kit and DSL-2100 Cortisol Coated-Tube Radioimmunoassay kit, respectively, obtained from Diagnostic Systems Laboratories (Webster, TX). Insulin was assayed using the Coat-A-Count Insulin radioimmunoassay kit by Siemens Medical Solutions Diagnostics (Los Angeles, CA). Non-esterified fatty acids and TG were analyzed colorimetrically using the HR Series NEFA-HR (2) kit and L-type TG H kit, respectively, obtained from Wako Diagnostics (Richmond, VA). All assays were performed according to the manufacturers' instructions.

Deuterium oxide analysis for determination of TBW was performed by Metabolic Solutions, Inc. (Nashua, NH) using an isotope ratio mass spectrometer and the method described by Scrimgeour et al. (1993).

Statistics

All data are presented as mean ± standard error. The statistical model included fiber, fat, period, and all interactions. Time was included in the model as a repeated measure when appropriate. Data were assessed by ANOVA in the proc GLM program of SAS 9.0. When present, time and period differences were further separated using Tukey's mean separation test. Significance was defined as $p < 0.05$, while trends were considered when $p < 0.10$.

Results

Particle size distribution

Sieve analysis for PSD gave an average standard deviation of 0.52 g for the method, indicating that although such sieve analysis is based on an assumption of spherical particles, sieve analysis in this study is rather repeatable. For the grass hay portion of the diet (G), d_{gw} was 2.82 mm and S_{gw} was 2.41 mm. For the non-fat supplemented fiber mix (Mft), analyzed separately from the grass hay fraction, d_{gw} was 2.56 mm and S_{gw} was 2.34 mm. The fat-supplemented fiber mix had a d_{gw} of 2.49 mm and S_{gw} of 2.29 mm. There was no statistical difference among the dietary treatments in terms of particle size.

Feed intake

Feed intake as a percentage of BW demonstrated both a period*fiber interaction ($p < 0.05$, Table 8) and a fat effect ($p = 0.04$), whereas Ft (1.81 ± 0.04%) was less than NFt (1.92 ± 0.04%).

Table 8. Feed intake as a percentage of body weight in two-year-old Arabian horses consuming chopped grass hay (G) and a chopped grass hay: soluble fiber mix (GM).

Period	G	GM	SEM
1	1.39^a	1.47^a	0.06
2	1.51^a	2.08^b	0.06
3	1.86^a	2.12^b	0.06
4	1.92^a	2.57^b	0.06

^{abc} Values within a row lacking common superscripts differ ($p < 0.05$)

Day 0, 7, and 14

On d 0, there was no difference in BM, PCV, TS, pH, K, Cl, Ca, Mg, glucose, lactate, BUN, or OSM due to fiber, fat, or period. Na exhibited a period difference ($p < 0.05$) at 136.6, 138.6, 138.3, and 137.1 ± 0.4 mmol/l in periods 1-4, respectively. Glucose was not analyzed for d 0 and 7 due to a problem with the analyzer in period 4.

On d 7, the only difference observed was that of a period difference in K ($p < 0.05$). Period 2 (3.90 ± 0.09 mmol/l) was greater than period 4 (3.37 ± 0.09 mmol/l); periods 1 and 3 were intermediate (3.80, 3.67 ± 0.09 mmol/l, respectively).

On d 14, BM exhibited a diet difference, being greater ($p = 0.048$) in GM than G (373, 362 ± 8 kg, respectively). Blood pH exhibited both a fat*period and fiber*period interaction, with Ft (7.45 ± 0.004) being greater ($p = 0.03$) than NFt (7.42 ± 0.004) and GM (7.45 ± 0.004) greater ($p = 0.03$) than G (7.42 ± 0.004) in period 2 only. Cl exhibited a fiber*period interaction ($p < 0.01$), with G greater than GM in period 1 only (105.4, 101.8 ± 0.6 mmol/L). No other blood parameters were different due to fat, fiber, or period.

Body Mass and Total Body Water

Body mass at the start of the exercise bout was greater ($p = 0.04$) in horses consuming GM than G (375 ± 7, 366 ± 7 kg, respectively). Uncorrected BM loss over the course of the exercise bout was not different due to fiber (p =

0.22), fat ($p = 0.67$), or period ($p = 0.66$) at 2.2 ± 0.1%. When corrected for fecal and urine losses and water intake, corrected BM loss was 4.1 ± 0.2% and did not differ due to fiber, fat, or period.

TBW as a percentage of BM averaged 66.1 ± 0.9 % of BM and was not different due to period, fat, fiber, or any interaction.

Water intake

Water intake on d 17 was highly variable by horse and not different due to fiber, fat, or period (data not reported). Water intake during the exercise test exhibited both a period and a fiber difference. Water intake was greater ($p < 0.001$) in period 4 (14.3 ± 1.4 L) than periods 1-3 (11.7, 11.5, 10.8 ± 1.4 L, respectively). Water intake was also greater ($p = 0.01$) in G (13.3 ± 1.3 L) than GM (10.9 ± 1.3 L).

Heart Rate and Core Body Temperature

HR was not different due to fiber, fat, or period at the start of the exercise test, at the trot, or at the end of the test. At the canter, a fat*fiber*period interaction was present (Table 9), but showed no consistent pattern.

Core body temperature was not different by fiber, fat, or period at the start of the exercise test, trot, canter, or end. Mean core body temperature during the trot was 37.1 ± 0.3° C and at the canter was 37.6 ± 0.3° C.

Table 9. Average heart rate (SEM) in horses during the canter portion of a 60-km exercise test in horses consuming diets containing grass hay (G) or a grass hay soluble fiber mix (GM) either with (Ft) or without (NFt) supplemental fat. (NS= non-significant)

		Fat		p-value for row
Period	Fiber	Ft	NFt	difference
1	G	144 (4)	137 (30	NS
	GM	139 (3)	148(5)	NS
p-value for a column difference		NS	NS	
2	G	135 (3)	152 (5)	$p < 0.05$
	GM	146(4)	139 (3)	NS
p-value for a column difference		NS	NS	
3	G	134 (3)	134(4)	NS
	GM	136 (6)	135(4)	NS
p-value for a column difference		NS	NS	
4	G	148 (5)	128 (4)	$p < 0.05$
	GM	139 (4)	143(3)	NS
p-value for a column difference		NS	$p < 0.05$	

Blood parameters

No differences were observed due to fat, fiber, period, or any interaction at the start of the exercise bout in PCV, TS, Na, K, Cl, Ca, Mg, lactate, or OSM. Blood pH at the start of exercise was different by period ($p < 0.05$, Table 10) and fiber ($p = 0.02$), being lower in horses G (7.446 ± 0.003) than GM (7.457 ± 0.003). Blood glucose at start was different by period ($p < 0.01$, Table 10) and by fat ($p = 0.04$), with Ft (110.9 ± 3.2 mg/dl) greater than NFt (104.7 ± 3.2 mg/dl). A fiber difference ($p < 0.05$) was also observed for start BUN, with G (15.0 ± 0.8 mg/dl) less than GM (16.4 ± 0.8 mg/dl).

During the final canter of each exercise bout there was no time effect on blood parameters, thus canter blood samples were combined for statistical analysis. PCV was greater ($p =0.02$) in G (36.8 ± 1.2) than GM (35.1± 1.2). TS showed a trend for a fiber effect ($p = 0.06$), being greater in GM (6.4 ± 0.1) than G (6.2 ± 0.1), as well as a period effect ($p < 0.05$) being greater in period 1 (6.5 ± 0.1) than period 4 (6.2 ± 0.1). Blood pH exhibited a fat*period interaction, being greater ($p < 0.05$) in Ft (7.51 ± 0.01) than NFt (7.45 ± 0.01) in period 2 only. Blood pH also exhibited a fiber*period interaction, being greater ($p< 0.05$) in G (7.50 ± 0.01) than GM (7.45 ± 0.01) in period 3. Blood glucose exhibited a fat*fiber*period interaction (Table 11). Lactate was greater ($p = 0.01$) in horses consuming G (1.7 ± 0.2 mmol/l) than GM (1.2 ± 0.2 mmol/l), and was greater ($p < 0.05$) in Ft (1.5 ± 0.2 mmol/l) than NFt (1.3 ± 0.2 mmol/l). Na, K, Cl, Mg, BUN, and OSM were not different due to fat, fiber, or period at the canter.

Table 10. Blood pH and blood glucose in horses at the start of a 60-km exercise bout.

	Period 1	Period 2	Period 3	Period 4	SEM
pH	7.445^{a}	7.464^{b}	7.442^{a}	$7.456^{a,b}$	0.004
Glucose (mg/dL)	116.5^{c}	109.8^{b}	$105.3^{a,b}$	99.4^{a}	3.4

^{abc} Values within a row lacking common superscripts differ ($p < 0.05$)

Table 11. Blood glucose (SEM) during the canter portions of a 60-km exercise test in horses consuming diets containing grass hay (G) or a grass hay soluble fiber mix (GM) either with (Ft) or without (NFt) supplemental fat.

		Fat		p-value for row
Period	Fiber	Ft	NFt	difference
1	G	126.1 (4.4)	116.6 (3.3)	p < 0.05
	GM	123.9 (3.5)	98.3 (5.3)	p < 0.01
p-value for a column difference		NS	p < 0.05	
2	G	120.0 (3.4)	137.4 (5.3)	p < 0.05
	GM	107.0 (4.4)	112.1 (3.4)	NS
p-value for a column difference		p < 0.10	p < 0.05	
3	G	116.9 (3.3)	103.5 (3.3)	p < 0.05
	GM	114.5 (5.3)	105.7 (4.6)	p < 0.10
p-value for a column difference		NS	NS	
4	G	113.3 (5.3)	96.6 (4.6)	p < 0.05
	GM	105.2 (3.4)	100.78 (3.4)	p < 0.10
p-value for a column difference		NS	NS	

At the end of the exercise test, lactate showed a trend ($p = 0.06$) to be higher in G (1.4 ± 0.2 mmol/l) than GM (0.9 ± 0.2 mmol/l). BUN was less ($p < 0.05$) in G (17.1 ± 0.9 mg/dl) than GM (18.8 ± 0.9 mg/dl). No other blood variables were different at the end of exercise.

Hormones

Insulin exhibited a fiber effect at the start of the exercise bout, where GM (12.0 ± 1.3 μIU/ml) was greater ($p = 0.0001$) than G (4.3 ± 1.3 μIU/ml). Insulin was also greater ($p = 0.04$) in GM than G after the exercise test (8.6, 4.9 ±1.2 μIU/ml, respectively). Aldosterone was different by time ($p < 0.0001$, Table 12) and fiber. The mean across all times was lower ($p = 0.001$) in GM (28.4 ± 3.8 pg/ml) than G (53.3 ± 3.8 pg/ml). Cortisol also exhibited a time ($p < 0.0001$, Table 13) and fiber difference, being lower ($p = 0.01$) in G than GM (1.82 ± 0.13, 2.40 ± 0.13 μg/dl, respectively).

NEFA and TG

At the start of the exercise test, NEFA exhibited a fiber effect, being greater ($p < 0.006$) in G (0.69 ± 0.06 mEq/l) than GM (0.33 ± 0.06 mEq/l). At the conclusion of the exercise test, G (1.71 ± 0.07 mEq/l) remained greater ($p < 0.05$) than GM (1.32 ± 0.07 mEq/l). Like NEFA, TG were greater ($p = 0.01$) at the start of exercise in G (68.1 ± 8.6 mg/dl) than GM (30.3 ± 8.6 mg/dl). At the conclusion of exercise, TG demonstrated a fat*fiber interaction ($p < 0.05$, Table 14).

Table 12. Aldosterone (pg/ml) in horses completing a 60-km exercise test.

Start B1	End B4	1 d Post	SEM
36.7^a	60.8^b	25.5^a	4.3

ab Values within a row lacking common superscripts differ ($p < 0.05$)

Table 13. Cortisol (µg/dl) in horses completing a 60-km exercise test.

Start B1	End B2	Start B3	End B4	1 d Post	SEM
1.98^b	3.08^c	1.71^b	3.13^c	0.64^a	0.18

abc Values within a row lacking common superscripts differ ($p < 0.05$)

Table 14. Plasma triglyceride concentration (mg/dl) after a 60-km endurance exercise test in horses consuming diets containing grass hay (G) or a grass hay soluble fiber mix (GM) either with (Ft) or without (NFt) supplemental fat.

	Fat		
Fiber	Ft	NFt	p-value for row difference
G	295.4 (25.9)	132.4 (25.9)	$p < 0.01$
GM	32.0 (25.9)	35.5 (25.9)	NS
p-value for column difference	$p < 0.01$	$p < 0.05$	

Discussion

Horses consuming diets containing a soluble fiber mix (GM) showed greater body mass than those consuming grass hay alone (G) after 14 and 21 d on the respective fiber type. Feed intake, however, was greater in GM after the first period. Differences in feed intake would equate to about 0.4 kg/d. Over the course of 14 d, this would be equivalent to 5.6 kg, but differences in BM were approximately 11 kg. While we observed no differences in water intake on d 17, variability among horses was great with one horse showing no water intake when stalled regardless of diet. Warren et al. (1999) previously demonstrated increased body mass in horses consuming a diet high in soluble fiber, as a result of increased water intake. Thus, the difference in BM we observed due to fiber type may have been attributable to both increased feed intake and increased water intake. Greater body mass as a result of greater water within the large intestine may then have provided the animals with a reservoir for use during the exercise bout. This could be further supported by the fact that horses consuming GM consumed less water during the course of the exercise test than those consuming G, as well as had lower PCV during the canter portions of the exercise test.

Unlike our previous study where horses consuming a fat supplemented soluble fiber diet showed greater body mass loss during exercise (Spooner, Chapter III Dissertation), body mass loss in this study was not different due to fiber, fat, or period. Corrected and uncorrected body mass loss (2.2 and 4.1%) were similar to those we previously reported (2.7 and 4.2%) and similar to that reported by Dusterdieck et al. (1999) using the same exercise test protocol. Body mass loss in the controlled laboratory setting was, as expected, less than that reported from field studies (Schott et al., 1997).

Total body water was also not different due to treatment at 66.1 ± 0.1% BM. The TBW observed here is greater than that previously reported by Andrews et al. (1997) and in our previous study. In our previous study, we reported increased TBW in horses consuming a grass hay and chopped soluble fiber mix or grass hay and alfalfa hay as opposed to grass hay alone. We suggested differences in that study may have been related to increased soluble fiber content in the latter two diets. However, in this study, we saw no difference according to fiber.

During the course of the exercise test, we observed no difference in core body temperature or heart rate at the start, end, or trot. Investigation of a fiber*fat*period interaction present during heart rate at the canter revealed no clear pattern and is likely experimental artifact as opposed to a reproducible effect. Interestingly, core body temperature at the canter in all diets in this study was similar to the core body temperature in horses consuming the fat-supplemented soluble fiber mix in our previous study, and more than 1° C less than those horses consuming grass hay or grass hay and alfalfa hay in the previous study.

Looking at blood variables, we can attribute differences observed in BUN to slight differences in protein content between G and GM. Differences in blood pH were inconsistent in regard to fiber, with GM greater than G at the start of exercise, but G was greater than GM during the canter in period 4. These differences, less than 0.02 at the start, while statistically significant were likely of little physiological significance.

Blood glucose concentration, as hypothesized, was greater in horses consuming the fat supplemented diets (Ft) over those not supplemented (NFt) at the start of exercise. With the exception of period 2, horses consuming Ft showed greater blood glucose concentration during the canter as well. Similar results have been previously reported and are generally attributed to a glycogen sparing effect of the fat-supplemented diet during low intensity exercise (Meyers et al., 1987).

Such differences in blood glucose were accompanied by greater blood lactate post- exercise in horses receiving fat supplementation. Meyers et al. (1987) reported lower lactate concentrations in fat -supplemented horses. Lower lactate concentrations may be expected as a result of increased muscle oxidative capacity often resulting from fat supplementation through increased enzymatic activity (Orme et al., 1997). Research by Ferrante et al. (1994) also showed increased lactate in fat-supplemented horses and the authors suggested it may be the result of reduced pyruvate dehydrogenase activity. It is important to recognize, however, that the lactate concentrations reached in our 60-km exercise bout remained less than 2 mmol/l, perhaps suggesting little physiological significance.

Insulin exhibited only a fiber effect and was greater in GM than G at both the start and end of exercise. This can likely be attributed to greater simple sugar concentration and NFC in the GM diets. Or, as reported by Hallebeek and Beynen (2003), horses consuming diets high in pectin, such as beet pulp, may experience increased glucose and insulin levels post-prandially as a result of attenuated starch digestion and increased propionic acid production. Greater insulin concentration could also be responsible for increased cortisol levels in GM compared to G.

Differences in aldosterone concentration over time were similar to those observed in our previous study (Spooner, Chapter III Dissertation). However, in the current study, a fiber effect was identified, with horses consuming GM having 47% lower aldosterone concentration across all times. Aldosterone content is often correlated to K content of the diet (Clarke et al., 1988), and in this study K was slightly higher in G than GM. More likely, however, reduced aldosterone could be associated with a reservoir of available water in the hindgut of horses consuming GM.

Plasma TG were lower in GM than G both before and after exercise. At the conclusion of exercise, TG were more than 75% lower in horses consuming the soluble fiber mix. At the conclusion of exercise, in horses consuming G, fat supplementation (Ft) also resulted in greater TG than did no supplementation (NFt). We previously observed reduced plasma TG in horses consuming a fat supplement soluble fiber mix (Spooner, Chapter III dissertation). It appears that the majority of that difference, then, was likely due to fiber type as opposed to fat supplementation. An effect of fiber type on TG has been previously reported in hamsters, where feeding highly fermentable soluble fibers resulted in reduced

TG (Terpstra et al., 1998), and in horses. Horses fed beet pulp, known to be high in pectin, at 25% of the diet showed lowered TG in the fasting state. (Hallebeek and Beynen, 2003).

Greater plasma NEFA in horses consuming G than GM reported is perplexing. Hallebeek and Beynen reported increased NEFA in horses consuming a 25% beet pulp diet. We previously observed no difference in NEFA due to diet (Spooner, Chapter III Dissertation). However, two studies in humans suggest suppression of NEFA levels following high fiber meals (Raben et al., 1994; Wolever et al., 1995).

In all, results from this study suggest that dietary fiber type plays a larger role than fat supplementation in the hydration status of endurance horses. While no effect of fiber type on TBW was observed, differences in body weight may suggest a greater water reservoir within the large intestine in horses consuming a soluble fiber diet. This is further supported by less water consumption during the exercise bout, lower PCV at the canter, and lower aldosterone concentration throughout the course of the endurance exercise test. Thus, this research adds to the increasing body of evidence (Danielsen et al., 1995; Warren et al., 1999) to suggest that the feeding of soluble fibers may increase water reservoir present in the equine large intestine.

It is important to remember, however, that all diets in the present study were prepared as chopped mixes. In our initial study (Spooner, Chapter III Dissertation), only the chopped soluble fiber mix diet was prepared as a chopped fiber. Thus, the lack of a difference in TBW and core body temperature observed in this study may indicate a role of fiber length. In fact, TBW and core body temperature for all diets in this study were more similar to the grass hay: chopped soluble fiber mix diet from the initial study. While microbial fermentation likely has little effect on particle length, it has been shown to reduce particle size in the ruminant by weakening particles (Jung and Allen, 1995), likely releasing water. Providing horses with chopped fiber sources, as in the current study, and as opposed to long stemmed roughage, could then increase fermentability of the fiber simply as a result of decreasing particle size or increasing surface area. Fermentability, in turn has been linked to water holding and subsequent releasing capacity (McBurney et al., 1985).

While short-chopped feed has been provided to horses in several studies, none have investigated the effect on cecal fermentation or hydration status. Digestibility and retention time, however have been reported to be similar between long-stemmed hay and short-chopped feed (Morrow et al., 1999). Thus, concern over rate of passage decreasing digestibility as observed in ruminants fed chopped feedstuffs may not be applicable to the horse. It is reasonable, then, to suggest that additional studies are needed to determine the effect of fiber length and/or processing on the hydration status of endurance horses.

CHAPTER V

Summary and Conclusions

Fluid and electrolyte loss in the equine endurance athlete has both performance and animal welfare implications. As a result, diet manipulations resulting in a greater fluid reservoir within the equine large intestine would be well received by the ever-growing competitive endurance riding sector. Previous work suggested diets containing more soluble fiber may bind and release water more efficiently within the equine large intestine (Danielsen et al., 1995). Other researchers observed differences in initial body mass and body weight loss through pharmacological dehydration in horses consuming diets high in soluble fiber compared with those consuming diets low in fiber (Warren et al., 1999). The question of whether dehydration resulting from endurance exercise would elicit similar differences as a result of dietary fiber type remained unanswered.

Our initial research, then, sought to investigate the effect of dietary fiber type on hydration status. We observed greater TBW in horses consuming either diets containing 50% grass hay and either 50% alfalfa hay or 50% chopped, soluble fiber mix, compared to grass hay alone. Further, horses consuming the chopped, soluble fiber mix lost more body weight during the course of the exercise bout, but maintained a lower core body temperature at the canter. While we suggested that greater total body water may have resulted in a greater pool of available water for use in thermoregulation, differences in fat-content of the diet as well as differences in fiber length between diets made conclusive establishment of causality impossible.

Our second study sought to further examine the effect of dietary fiber type, both with and without dietary fat supplementation. Fat supplementation has been previously reported to be beneficial to horses (and humans) exercising aerobically, by providing an additional fuel-source and sparing muscle glycogen (Meyers et al., 1987; Potter et al., 1992; Scott et al., 1992). At the same time, we provided all treatment diets as chopped fiber to avoid any differences as a result of fiber length.

Results from this experiment indicated differences in body mass as a result of fiber type, with horses consuming the soluble fiber mix showing greater body mass at the start of exercise. While these horses consumed more feed, the difference in feed intake was not enough to completely bring about the difference in body weight. While we did not observe a difference in water intake, measured on a single day, we speculate that increased water consumption was responsible for the remaining body mass difference. A similar increase in body mass as a result of increased water intake was previously reported for horses consuming diets high in soluble fiber (Warren et al., 1999). Thus, horses consuming the soluble fiber mix diet likely had a greater water reservoir at the initiation of exercise. This is further supported by reduced water intake in GM, although body mass loss was similar between fiber types. PCV remained greater throughout the canter portion of the exercise test as well.

This study also suggested that differences observed in TG in our first project were likely attributed to fiber type, instead of fat supplementation as we initially suggested. Only fiber type, not fat supplementation, resulted in differences in plasma TG or NEFA before exercise. After exercise, fat supplementation resulted in small differences, but the majority of difference was attributable to fiber type. Consumption of diets containing soluble fibers caused marked reduction in TG. This has been previously reported in horses consuming diets containing 25% beet pulp as a result of increased lipoprotein lipase activity (Hallebeek and Beynen, 2003). Fiber type also resulted in differences in plasma insulin, although we observed differences in glucose only as a result of fat supplementation.

Interestingly, we observed no differences in our second experiment in regard to TBW, core body temperature, or heart rate during exercise as a result of fiber type or fat supplementation. Yet, comparing the values obtained, TBW was more similar in our second study to those horses consuming the more soluble fiber types in the first experiment. At the same time, core body temperature was lower during exercise than previously observed, utilizing the same testing protocol. And corrected body weight loss was 0.5% lower over the course of the same exercise test. While the two studies cannot be directly compared, as the horses used were different as were environmental factors, this may suggest a role for diet processing, as all diets were provided as chopped mixes in the second study.

Short-chopped feeds have been provided to horses and are more common abroad than in the United States, particularly in countries with limited hay production. One concern with feeding chopped fiber, often noted here in the U.S., may be related to intake behavior. Even if retention time is unaffected by chopping, intake time may be reduced as a result of decreased mastication. Reduced feed intake time, generally as a result of reduced fiber intake, has been shown to increase oral stereotypies such as wood-chewing and crib-biting (McGreevy et al., 1995). Whether or not incidence of stereotypic behavior is affected by feed processing has not been reported. Furthermore, decreased feed intake time may result in longer periods of fasting between meals, which has been associated with equine gastric ulcer syndrome (EGUS) (Murray and Shusser, 1989).

In the ruminant, fiber length is of great concern in diet formulation as smaller particles may pass through the rumen too quickly resulting in reduced fermentation and digestibility. Particle size has also been correlated to rumen pH through salivation and mastication (Allen, 1997). The idea of a necessary fiber length has received wide attention and has been coined "effective fiber" (van Soest, 1994). Comparing horses to ruminants, horses have greater rate of passage for most feedstuffs and reduced fiber digestibility (Hintz et al., 1978). It is not surprising then that the horse may not have an effective fiber requirement. Previous research indicates no difference in digestibility or retention time when horses were fed short chaff as opposed to long-stemmed fibers (Morrow et al., 1999).

Conversely, in the equine, reducing particle size such as by providing a chopped fiber may allow for increased fermentation within a given retention period as a result of increased surface area. Increased fermentability then may result in more water released within the hind-gut. Fermentability has previously been correlated to water holding and releasing capacity (McBurney et al., 1985). Thus, it may be that diets consisting of chopped fibers, as opposed to soluble fibers, are better able to provide the horse with a reservoir of water within the hind-gut for use in attenuating dehydration during endurance exercise.

Unfortunately no studies have investigated the role of fiber size or processing on hydration status. Yet, all studies, investigating the role of soluble fibers on hydration status have confounded type and processing as a result of utilizing chopped beet pulp (Danielsen et al., 1995; Warren et al., 1999) or a chopped soluble fiber source. Thus, current evidence makes it difficult to determine if it is fiber type or fiber length that may be responsible for differences observed in the hydration status of horses. Additional research, both *in vitro* and *in vivo*, should investigate the role of fiber length or size in water holding and releasing capacity within the equine large intestine.

APPENDIX A

Raw Data- Project Year One

Horse	Period	Diet	Hay	Fiber Mix	Total	Ratio	BM	Intake as %BM
Amici	2	GM	3.86	2.38	6.24	1.62	387	1.61%
Amici	3	G	8.03		8.03		388	2.07%
Amici	4	GA	10.24		10.24		394.5	2.60%
Avanti	2	GA	6.99		6.99		385	1.82%
Avanti	3	GM	4.24	3.12	7.36	1.36	390	1.89%
Avanti	4	G	9.35		9.35		385	2.43%
RePlay	2	GM	3.62	2.07	5.69	1.75	398	1.43%
RePlay	3	G	7.25		7.25		397	1.83%
RePlay	4	GA	9.58		9.58		399	2.40%
Showtime	2	G	6.17		6.17		436	1.41%
Showtime	3	GA	9.54		9.54		420	2.27%
Showtime	4	GM	5.10	4.60	9.70	1.11	426	2.28%
Sully	2	GA	7.98		7.98		427	1.87%
Sully	3	GM	4.91	4.64	9.56	1.06	434.5	2.20%
Sully	4	G	9.99		9.99		433	2.31%
Vivo	2	G	5.10		5.10		368	1.39%
Vivo	3	GA	9.90		9.90		384.5	2.57%
Vivo	4	GM	5.52	4.71	10.23	1.17	388	2.64%

Horse	Period	Diet	TBW as %BW	ICF as %BW	ICF as %TBW	ECF as %BW	ECF as %BW
Showtime	1	G	0.605	0.456	0.753	0.150	0.247
Sully	1	GA	0.679	0.410	0.677	0.196	0.323
RePlay	1	GM	0.657	0.447	0.681	0.209	0.319
Vivo	1	G	0.671	0.405	0.604	0.266	0.396
Avanti	1	GA	0.640	0.360	0.563	0.280	0.437
Amici	1	GM	0.656	0.466	0.711	0.190	0.289
Showtime	2	GA	0.633	0.394	0.623	0.238	0.377
Sully	2	GM	0.649	0.399	0.615	0.250	0.385
RePlay	2	G	0.629	0.368	0.584	0.261	0.416
Vivo	2	GA	0.676	0.405	0.599	0.271	0.401
Avanti	2	GM	0.651	0.410	0.630	0.241	0.370
Amici	2	G	0.654	0.408	0.623	0.246	0.377
Showtime	3	GM	0.635	0.384	0.604	0.251	0.396
Sully	3	G	0.655	0.380	0.580	0.275	0.420
RePlay	3	GA	0.672	0.454	0.676	0.217	0.324
Vivo	3	GM	0.681	0.390	0.573	0.291	0.427
Avanti	3	G	0.625	0.423	0.676	0.202	0.324
Amici	3	GA	0.645	0.343	0.531	0.302	0.469

Horse	Diet	Period	Start Weight	End Weight	Uncorrected BM Loss	Water	Feces	Urine	Corrected BM Loss
Showtime	G	2	420	416.5	0.83%	16.25	2.5	0	0.24%
Showtime	GA	3	420	409	2.62%	12.5	2.5	0.5	1.90%
Showtime	GM	4	428.5	412.5	3.73%	9	3.5	0	2.92%
Sully	GA	2	421.5	411.5	2.37%	9.5	3	0	1.66%
Sully	GM	3	437	416.5	4.69%	9	4	0	3.78%
Sully	G	4	432.5	419.5	3.01%	14.5	5	0	1.85%
RePlay	GM	2	391.5	381.5	2.55%	10.75	3	1.5	1.40%
RePlay	G	3	390	384.5	1.41%	12	3	2	0.13%
RePlay	GA	4	393.5	383.5	2.54%	16.5	4	2	1.02%
Vivo	G	2	370.5	357	3.64%	7.5	2	0	3.10%
Vivo	GA	3	376.5	371.5	1.33%	13	3	0	0.53%
Vivo	GM	4	392	381	2.81%	12	4	0	1.79%
Avanti	GA	2	380	367.5	3.29%	7.5	2	0	2.76%
Avanti	GM	3	380	370.5	2.50%	10.75	3	1	1.45%
Avanti	G	4	384.5	375.5	2.34%	12.5	2.5	2	1.17%
Amici	GM	2	390.5	371	4.99%	4	2.5	2	3.84%

Horse	Diet	Day	Period	BM-kg	Ab 1-cm	Ab 2-cm	Ab 3-cm	PCV (%)	TS-g/dl
Amici	GM	0	1	402	180	190.5	171	34	6.45
Amici	GM	7	1	387	173	184	168	33.5	6.4
Amici	G	0	2	383	180	188	165	34.5	6
Amici	G	7	2	388	179	188	168	36	6.4
Amici	GA	0	3	393	180	188	168	32.5	6.25
Amici	GA	7	3	394.5	182	190	169	34	6
Avanti	GA	0	1	403	184	182	169	31.5	6.4
Avanti	GA	7	1	385	179	178	157.5	38	6.7
Avanti	GM	0	2	384	181.5	182	162.5	40	6.2
Avanti	GM	7	2	390	182	181	162	38	6.15
Avanti	G	0	3	382	181	181	161	37.5	6.4
Avanti	G	7	3	385	181	179	163	40.5	6.4
RePlay	GM	0	1	424	183	185.4	165		
RePlay	GM	7	1	398	178	180	161	34.5	6.5
RePlay	G	0	2	396	182	186	168	34	6.4
RePlay	G	7	2	397	186	189	171	35.5	6.15
RePlay	GA	0	3	394.5	181	184	165	34	6.4
RePlay	GA	7	3	399	182	183	167	31.5	6
Showtime	G	0	1	439	190.5	195.5	178		
Showtime	G	7	1	436	190.5	195.5	175	36.5	6.35
Showtime	GA	0	2					35	6.55
Showtime	GA	7	2	420	189	192	174	35	6
Showtime	GM	0	3	424	187	189	173	35	6.2
Showtime	GM	7	3	426	191	195	177	31.5	6
Sully	GA	0	1	429	184	193	173		
Sully	GA	7	1	427	179	192	170	28	6.3
Sully	GM	0	2					32.5	6.5
Sully	GM	7	2	434.5	185	197	171	38	6.5
Sully	G	0	3	433	185	192	166	30	6.4
Sully	G	7	3	433	185	195	171	36.5	6.3
Vivo	G	0	1	390	180	183	168	40	6.5
Vivo	G	7	1	368	175	178	163	35	6.5
Vivo	GA	0	2	375	177	181	165	44	6.45
Vivo	GA	7	2	384.5	181	182	164	38	6.05
Vivo	GM	0	3	383	180	179.5	167	38	6.35
Vivo	GM	7	3	388	181	184	164	37.5	6.35

Horse	Diet	Day	Period	pH	pCO2-mmHg	pO2-mmHg	Na-mmol/L	K-mmol/L	Cl-mmol/L
Amici	GM	0	1	7.47	45.3	46.85	137.35	4.18	101.00
Amici	GM	7	1	7.42	47.2	44.4	137.95	3.72	99.65
Amici	G	0	2	7.43	49.15	43.05	138.95	3.57	100.95
Amici	G	7	2	7.45	50.4	43.2	134.95	3.96	103.35
Amici	GA	0	3	7.45	49.75	43.05	138.45	4.31	100.75
Amici	GA	7	3	7.43	51.9	38.6	137.60	3.62	98.05
Avanti	GA	0	1	7.44	46.6	39.35	135.65	4.50	101.35
Avanti	GA	7	1	7.45	48.5	35.9	137.85	5.03	99.05
Avanti	GM	0	2	7.45	47.55	38.5	139.50	3.41	101.40
Avanti	GM	7	2	7.48	48.1	35.95	135.75	3.96	105.90
Avanti	G	0	3	7.46	47.65	41.4	139.55	4.17	101.50
Avanti	G	7	3	7.44	50.55	35.3	138.85	4.35	98.70
RePlay	GM	0	1	7.48	46.4	39.2	138.35	3.51	98.10
RePlay	GM	7	1	7.42	48.85	34	138.25	4.55	104.90
RePlay	G	0	2	7.45	48.6	36.7	136.65	4.28	102.10
RePlay	G	7	2	7.44	51.3	37.95	138.15	3.31	101.15
RePlay	GA	0	3	7.45	48.55	38.95	140.00	3.07	99.60
RePlay	GA	7	3	7.46	48.8	36.4	139.85	3.89	102.70
Showtime	G	0	1	7.47	43.3	35.65	138.70	3.84	98.75
Showtime	G	7	1	7.45	47.55	31.5	137.25	3.95	103.70
Showtime	GA	0	2	7.45	47.55	34.9	134.60	3.97	102.65
Showtime	GA	7	2	7.44	47.05	39.85	136.10	3.26	102.40
Showtime	GM	0	3	7.45	47.85	41.55	139.75	3.33	100.15
Showtime	GM	7	3	7.46	48.05	36.05	140.00	3.60	104.90
Sully	GA	0	1	7.45	52.25	36	134.20	3.40	101.25
Sully	GA	7	1	7.41	49.5	36.5	135.40	3.93	569.60
Sully	GM	0	2	7.44	45.35	39.65	136.30	3.88	101.50
Sully	GM	7	2	7.43	53.05	38.9	138.80	4.18	99.40
Sully	G	0	3	7.43	49.2	44	139.30	3.94	99.05
Sully	G	7	3	7.46	50.5	36.35	139.30	3.61	101.90
Vivo	G	0	1	7.48	40.4	36.7	137.70	4.36	101.25
Vivo	G	7	1	7.45	46.25	34.9	135.25	4.36	100.65
Vivo	GA	0	2	7.45	49.35	35.5	136.00	3.96	101.70
Vivo	GA	7	2	7.50	46.7	34.8	134.90	3.72	104.80
Vivo	GM	0	3	7.47	46.3	31.8	138.25	4.39	102.20
Vivo	GM	7	3	7.46	48.7	37.6	140.25	4.35	98.05

Horse	Diet	Day	Period	Ca-mg/dL	Mg-mg/dL	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L
Amici	GM	0	1	6.47	1.17	108.5	1	25	8.60
Amici	GM	7	1	6.47	1.05	112	0.65	17	6.35
Amici	G	0	2	5.90	1.04	99.5	0.35	13	8.30
Amici	G	7	2	6.26	1.10	100	0.5	18	10.15
Amici	GA	0	3	6.39	1.09	102.5	0.15	21.5	10.00
Amici	GA	7	3	5.88	1.17	99.5	0.8	20	9.85
Avanti	GA	0	1	6.68	1.25	114.5	0.85	23.5	7.60
Avanti	GA	7	1	6.12	1.02	110.5	0.8	18	9.00
Avanti	GM	0	2	6.09	1.07	106.5	0.7	19	8.80
Avanti	GM	7	2	5.88	0.99	106	0.4	12	11.90
Avanti	G	0	3	6.05	0.98	111.5	0	14	9.90
Avanti	G	7	3	5.89	1.19	103	0.95	18	10.40
RePlay	GM	0	1	6.20	1.20	108	0.15	21	10.95
RePlay	GM	7	1	6.73	1.23	118	0.9	17	6.60
RePlay	G	0	2	6.57	1.14	104.5	0.4	14	9.00
RePlay	G	7	2	6.34	1.09	97	0.65	17	10.00
RePlay	GA	0	3	6.32	1.05	110	0.65	15	8.85
RePlay	GA	7	3	6.06	0.91	96.5	0	19	10.50
Showtime	G	0	1	6.56	1.28	115.5	0.1	19	7.60
Showtime	G	7	1	6.51	1.14	113		17	8.35
Showtime	GA	0	2	6.39	1.06	105	0.65	15	9.05
Showtime	GA	7	2	6.49	1.20	104.5	0.8	16.5	7.70
Showtime	GM	0	3	6.24	1.07	113	0.6	16	9.05
Showtime	GM	7	3	6.07	0.95	109	0	12	10.10
Sully	GA	0	1	5.99	1.17	97	0.15	21	11.55
Sully	GA	7	1	6.37	1.10	101.5	0.9	17.5	6.50
Sully	GM	0	2	6.47	1.16	100	0.4	16	6.55
Sully	GM	7	2	6.37	1.32	107	0.55	10	9.95
Sully	G	0	3	6.16	1.04	103	0.3	10	7.90
Sully	G	7	3	6.06	0.99	100.5	0	15.5	11.95
Vivo	G	0	1	6.22	1.13	107.5	0.9	26.5	6.40
Vivo	G	7	1	6.35	1.00	110	0.8	19	7.85
Vivo	GA	0	2	6.12	1.16	94	1.1	18	9.90
Vivo	GA	7	2	5.80	0.91	96	0.5	17.5	12.60
Vivo	GM	0	3	6.11	0.94	102.5	0	23.5	9.65
Vivo	GM	7	3	6.02	1.22	103	1.4	15	10.40

Horse	Diet	Day	Period	HCO3-mmol/L	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg
Amici	GM	0	1	32.80	6.70	1.20	7.7	279.5
Amici	GM	7	1	30.95	6.55	1.06	11.05	278
Amici	G	0	2	33.05	6.01	1.05	8.5	277.5
Amici	G	7	2	35.00	6.43	1.11	136.7	272
Amici	GA	0	3	34.75	6.57	1.11	7.25	280
Amici	GA	7	3	34.90	5.99	1.18	8.3	277.5
Avanti	GA	0	1	32.05	6.84	1.26	6.75	276
Avanti	GA	7	1	33.75	6.28	1.04	10.15	278
Avanti	GM	0	2	33.45	6.26	1.09	8.05	281
Avanti	GM	7	2	36.20	6.14	1.01	9.5	272
Avanti	G	0	3	34.40	6.27	1.00	7.85	280
Avanti	G	7	3	34.75	6.02	1.20	9.7	279.5
RePlay	GM	0	1	34.90	6.48	1.23	8.95	280
RePlay	GM	7	1	31.55	6.79	1.24	6.4	278.5
RePlay	G	0	2	33.65	6.73	1.16	5.25	274
RePlay	G	7	2	35.05	6.48	1.11	5.3	277.5
RePlay	GA	0	3	33.55	6.48	1.07	9.9	281
RePlay	GA	7	3	35.00	6.26	0.93	6.05	281
Showtime	G	0	1	31.40	6.80	1.31	12.4	280.5
Showtime	G	7	1	32.90	6.68	1.15	4.6	276.5
Showtime	GA	0	2	33.55	6.58	1.08	8.7	270.5
Showtime	GA	7	2	32.20	6.64	1.22	4.75	274
Showtime	GM	0	3	33.55	6.41	1.08	9.35	280.5
Showtime	GM	7	3	34.45	6.29	0.97	4.2	280
Sully	GA	0	1	36.35	6.14	1.18	2.3	271.5
Sully	GA	7	1	31.45	6.40	1.10	6.9	273
Sully	GM	0	2	30.90	6.61	1.17	7.85	274
Sully	GM	7	2	35.30	6.47	1.33	8.3	277
Sully	G	0	3	32.90	6.27	1.05	11.3	277
Sully	G	7	3	36.15	6.26	1.01	4.8	279
Vivo	G	0	1	29.90	6.48	1.16	10.9	281
Vivo	G	7	1	32.15	6.52	1.01	6.8	273.5
Vivo	GA	0	2	34.85	6.32	1.17	3.4	273.5
Vivo	GA	7	2	36.75	6.13	0.94	8.6	271.5
Vivo	GM	0	3	33.70	6.35	0.96	6.75	280.5
Vivo	GM	7	3	35.05	6.23	1.25	11.55	281

Horse	Diet	Period	Time	PCV- %	TS- g/dl	pH	pCO2- mmHg	pO2- mmHg
Amici	GM	1	Start B1	37	6.35	7.4485	52.15	36
Amici	GM	1	End B1	36	6.4	7.4505	51.4	36.3
Amici	GM	1	Start B2	39	6.5	7.445	49.95	34.55
Amici	GM	1	End B2	36	6.5	7.45	52.6	34.2
Amici	GM	1	Start B3	36	6.7	7.4255	52.75	35.8
Amici	GM	1	End B3	39	6.75	7.412	53.7	33.8
Amici	GM	1	Start B4	37	6.75	7.4425	48.25	35.8
Amici	GM	1	End B4	23	6.9	7.4515	52	34.3
Amici	GM	1	60 Post	37.5	6.95	7.4215	52.05	35.05
Amici	GM	1	1d Post	33	6.3	7.446	50.7	38.2
Amici	GM	1	2d Post	35.25	6.35	7.4265	50.9	43.85
Amici	GM	1	3d Post	34.5	6	7.433	49.15	43.05
Amici	G	2	Start B1	33	6.1	7.438	49.8	35
Amici	G	2	End B1	35.5	6	7.4595	47.75	40.55
Amici	G	2	Start B2	34	6	7.463	48.3	33.9
Amici	G	2	End B2	34	6.3	7.461	47.25	34.6
Amici	G	2	Start B3	36	6	7.446	49.9	33.55
Amici	G	2	End B3	35	6.2	7.449	50.6	32.05
Amici	G	2	Start B4					
Amici	G	2	End B4					
Amici	G	2	60 Post	35	6.45	7.446	47.6	34.2
Amici	G	2	1d Post	34.5	6.3	7.476	46.15	38.3
Amici	G	2	2d Post	33.5	6.4	7.451	45.5	39.4
Amici	G	2	3d Post	32.5	6.25	7.4495	49.75	43.05
Avanti	GA	1	Start B1	33.5	6.3	7.465	45.7	35.4
Avanti	GA	1	End B1	35.5	6.5	7.46	45.3	32.75
Avanti	GA	1	Start B2	36.5	6.5	7.488	40.4	33.1
Avanti	GA	1	End B2	36.5	6.95	7.452	44.85	33.75
Avanti	GA	1	Start B3	41	7	7.4365	43.3	35.7
Avanti	GA	1	End B3	36.5	7	7.4505	45.75	36.65
Avanti	GA	1	Start B4	35.5	6.95	7.4505	45.9	33.8
Avanti	GA	1	End B4	36.5	7	7.4475	44.4	35.5
Avanti	GA	1	60 Post	38	7.2	7.4275	46.7	36.3
Avanti	GA	1	1d Post	36	6.55	7.478	46	38.25
Avanti	GA	1	2d Post	34.5	6.4	7.4355	49.2	39.35
Avanti	GA	1	3d Post	40	6.55	7.4445	49.4	40.8
Avanti	GM	2	Start B1	34	6.5	7.4315	48.7	34.35
Avanti	GM	2	End B1	37	6.5	7.4325	48.75	39.05
Avanti	GM	2	Start B2	37	6.55	7.432	46.75	35.45
Avanti	GM	2	End B2	36	6.5	7.448	48.35	36.6
Avanti	GM	2	Start B3	33	6.6	7.4325	47.95	34.6
Avanti	GM	2	End B3	33.5	6.4	7.4465	48	34
Avanti	GM	2	Start B4	34.5	6.4	7.4475	45.25	35.2
Avanti	GM	2	End B4	34.5	6.6	7.4615	46.65	35.7
Avanti	GM	2	60 Post	27	6.4	7.4335	49.2	32.25
Avanti	GM	2	1d Post	38.5	6.6	7.4715	43.55	43.1
Avanti	GM	2	2d Post	38	6.5	7.461	41.9	43.5

Horse	Diet	Period	Time	PCV- %	TS- g/dl	pH	pCO2-mmHg	pO2-mmHg
Avanti	GM	2	3d Post	39	6.3	7.466	48.7	42.8
Avanti	G	3	Start B1	33	6.2	7.462	49.4	36.05
Avanti	G	3	End B1	33.5	6.25	7.4465	52	35.9
Avanti	G	3	Start B2	28.5	6.25	7.449	50.45	35.25
Avanti	G	3	End B2	33	6.2	7.4595	50.55	36.55
Avanti	G	3	Start B3	31.5	6.4	7.449	50.1	34.05
Avanti	G	3	End B3	31.5	6.2	7.4515	50.05	32.5
Avanti	G	3	Start B4	30	6.25	7.4415	49.05	33.4
Avanti	G	3	End B4	34.5	6.4	7.449	49.45	32.4
Avanti	G	3	60 Post	33	6.4	7.4335	51.5	32.8
Avanti	G	3	1d Post	32.5	6.4	7.481	43.7	40.25
Avanti	G	3	2d Post	35	6.4	7.4625	43.25	48.45
Avanti	G	3	3d Post					
RePlay	GM	1	Start B1	34.5	6.15	7.4575	46.5	36
RePlay	GM	1	End B1	34.5	6.4	7.4855	45	32.1
RePlay	GM	1	Start B2	37	6.4	7.5835	29.15	106.25
RePlay	GM	1	End B2	34	6.45	7.4735	43	35.55
RePlay	GM	1	Start B3	32.5	6.5	7.452	43.05	36.25
RePlay	GM	1	End B3	32.5	6.5	7.463	47.65	33.75
RePlay	GM	1	Start B4	32	6.55	7.4385	45.35	35.1
RePlay	GM	1	End B4	33	6.55	7.463	46.95	35.3
RePlay	GM	1	60 Post	30.5	6.4	7.434	46.7	36.4
RePlay	GM	1	1d Post	32	6.05	7.443	42.65	38.5
RePlay	GM	1	2d Post	34	6.35	7.443	47.35	38.95
RePlay	GM	1	3d Post	34	6.4	7.445	48.6	36.7
RePlay	G	2	Start B1	35	6.45	7.419	51.5	34.5
RePlay	G	2	End B1	36	6.6	7.427	46.9	34.6
RePlay	G	2	Start B2	34	6.55	7.406	47.45	35.8
RePlay	G	2	End B2	35	6.6	7.4065	49.65	34.7
RePlay	G	2	Start B3	29.5	6.45	7.409	49.8	35.1
RePlay	G	2	End B3	32.5	6.5	7.445	48.05	33.95
RePlay	G	2	Start B4	34	6.4	7.4365	46.9	32.8
RePlay	G	2	End B4	33.5	6.4	7.4595	48.5	33.45
RePlay	G	2	60 Post	30	6.4	7.4355	48.6	33
RePlay	G	2	1d Post	35	6.3	7.4405	48.95	36.35
RePlay	G	2	2d Post	31	6.4	7.44	49.5	36.95
RePlay	G	2	3d Post	34	6.4	7.445	48.55	38.95
RePlay	GA	3	Start B1	35	6.6	7.4185	50.1	35.5
RePlay	GA	3	End B1	34	6.6	7.4285	49.45	35.15
RePlay	GA	3	Start B2	29.5	6.55	7.417	48.05	34.35
RePlay	GA	3	End B2	32	6.75	7.4285	48.65	34.05
RePlay	GA	3	Start B3	32	6.6	7.4095	52.7	34.6
RePlay	GA	3	End B3	32.5	6.65	7.4365	47.45	35.2
RePlay	GA	3	Start B4	32	6.7	7.41	48.45	35.5
RePlay	GA	3	End B4	33.5	6.5	7.4475	48	32.45
RePlay	GA	3	60 Post	29.5	6.5	7.4275	50.15	33.85
RePlay	GA	3	1d Post	35	6.4	7.4385	48.4	38.15
RePlay	GA	3	2d Post	34	6.5	7.442	51.25	34.6

Horse	Diet	Period	Time	PCV- %	TS- g/dl	pH	pCO2- mmHg	pO2- mmHg
RePlay	GA	3	3d Post	33	6.4	7.434	48.5	36.05
Showtime	G	1	Start B1	33.5	6.5	7.425	46.85	35.7
Showtime	G	1	End B1	35	6.6	7.412	44.55	36.25
Showtime	G	1	Start B2	34	6.6	7.396	43.95	37.05
Showtime	G	1	End B2	34	6.7	7.419	46.95	34.1
Showtime	G	1	Start B3	25.5	7	7.403	44.85	34.15
Showtime	G	1	End B3	32.5	6.55	7.4225	46.65	35.5
Showtime	G	1	Start B4	33.5	6.6	7.4195	44.95	37.25
Showtime	G	1	End B4	34.5	6.75	7.436	43.95	33.1
Showtime	G	1	60 Post	33.5	6.85	7.4545	44.25	35.4
Showtime	G	1	1d Post	38	6.5	7.483	41.95	40.05
Showtime	G	1	2d Post	35	6.45	7.4455	43.8	34.95
Showtime	G	1	3d Post	32	6.5	7.4445	44.15	38.1
Showtime	GA	2	Start B1	32.5	6.4	7.449	48.6	36.5
Showtime	GA	2	End B1	37.5	6.8	7.4505	49.65	34.1
Showtime	GA	2	Start B2	31.5	6.85	7.409	49.4	35.1
Showtime	GA	2	End B2	34	6.95	7.4295	49.7	35.95
Showtime	GA	2	Start B3	31	6.85	7.444	49.45	36.95
Showtime	GA	2	End B3	34	6.9	7.4485	49.15	36.75
Showtime	GA	2	Start B4	31	6.9	7.4375	49.2	34.15
Showtime	GA	2	End B4	33.5	6.7	7.4555	46.6	34.65
Showtime	GA	2	60 Post	30	6.9	7.4555	47.5	35.15
Showtime	GA	2	1d Post	32.5	6.35	7.4605	50.5	39.9
Showtime	GA	2	2d Post	38	6.4	7.4485	47.95	36.25
Showtime	GA	2	3d Post	35	6.4			
Showtime	GM	3	Start B1	28	6.4	7.4315	51.6	36.1
Showtime	GM	3	End B1	30.5	6.35	7.44	47.4	33.65
Showtime	GM	3	Start B2	30	6.1	7.4215	47.95	35.95
Showtime	GM	3	End B2	34	6.5	7.44	47.25	36.95
Showtime	GM	3	Start B3	31.5	6.5	7.4525	45.4	36.25
Showtime	GM	3	End B3	33	6.45	7.432	47.5	34.15
Showtime	GM	3	Start B4	29.5	6.5	7.4115	47.75	32.7
Showtime	GM	3	End B4	32	6.5	7.4545	47.4	34
Showtime	GM	3	60 Post	24.5	6.6	7.4375	47.15	32.7
Showtime	GM	3	1d Post	36.5	6.5	7.4755	46.75	39.4
Showtime	GM	3	2d Post	34	6.5	7.451	48.15	38.7
Showtime	GM	3	3d Post	30.5	6.1	7.4435	47.65	37.75
Sully	GA	1	Start B1	36.5	6.6	7.437	47.05	37.4
Sully	GA	1	End B1	34	6.5	7.437	49.7	39.1
Sully	GA	1	Start B2	33	6.65	7.409	49.7	37.1
Sully	GA	1	End B2	34	6.95	7.4355	46.9	38.75
Sully	GA	1	Start B3	36.5	7	7.423	48.35	33.9
Sully	GA	1	End B3	39	7	7.418	49.05	35.3
Sully	GA	1	Start B4	36	7	7.4085	49.4	36.55
Sully	GA	1	End B4	37	7.1	7.4545	46.1	35.85
Sully	GA	1	60 Post	35	7	7.4535	45.7	33.4

Horse	Diet	Period	Time	PCV- %	TS- g/dl	pH	pCO2- mmHg	pO2- mmHg
Sully	GA	1	1d Post	32.5	6.75	7.461	46.7	36.45
Sully	GA	1	2d Post	33	6.05	7.44	51.6	37.5
Sully	GA	1	3d Post	33	6.25	7.4485	47.5	31.9
Sully	GM	2	Start B1	33	6.45	7.431	54.05	32.3
Sully	GM	2	End B1	32.5	6.55	7.438	52.25	39.85
Sully	GM	2	Start B2	34	6.8	7.427	52.05	36.3
Sully	GM	2	End B2	34.5	7	7.4385	50.35	36
Sully	GM	2	Start B3	17	7	7.4295	53.65	35
Sully	GM	2	End B3	34.5	6.85	7.4425	51.15	35.3
Sully	GM	2	Start B4	32	6.75	7.4155	52.25	33.6
Sully	GM	2	End B4	35	6.85	7.4765	49.1	34.35
Sully	GM	2	60 Post	30	6.8	7.4755	50.7	32.1
Sully	GM	2	1d Post	32.5	6.4			
Sully	GM	2	2d Post	34	6.5	7.4155	53.15	38.75
Sully	GM	2	3d Post	36	6.5	7.415	51.6	41.7
Sully	G	3	Start B1	28.5	6.3	7.4055	56.2	31.6
Sully	G	3	End B1	36.5	6.6	7.4195	48.2	34.25
Sully	G	3	Start B2	34	6.5	7.3985	49.55	31.9
Sully	G	3	End B2	35	6.5	7.4325	49.95	34.1
Sully	G	3	Start B3	34	6.4	7.4185	51.65	32.9
Sully	G	3	End B3	34	6.4	7.4435	50	34.25
Sully	G	3	Start B4	33.5	6.4	7.4435	47.9	31.15
Sully	G	3	End B4	34.5	6.5	7.4455	49.4	34.55
Sully	G	3	60 Post	32.5	6.5	7.4335	52.2	31.95
Sully	G	3	1d Post	30	6.4	7.445	49.9	40.6
Sully	G	3	2d Post	30.5	6.4	7.4475	49.5	34.85
Sully	G	3	3d Post	37	6.8	7.443	46.95	38.75
Vivo	G	1	Start B1	36	6.55	7.5475	30.1	110.15
Vivo	G	1	End B1	36	6.55	7.439	45.55	35.95
Vivo	G	1	Start B2	35	6.5	7.4335	44.35	37.85
Vivo	G	1	End B2	37	6.6	7.448	41.35	38.3
Vivo	G	1	Start B3	35	6.7	7.438	42.2	37.85
Vivo	G	1	End B3	36	6.8	7.44	44.45	32.9
Vivo	G	1	Start B4	34.5	6.75	7.427	41	34.3
Vivo	G	1	End B4	31.5	6.8	7.445	42	36.4
Vivo	G	1	60 Post	32	6.6	7.4365	42.7	33.15
Vivo	G	1	1d Post	29.5	6.45	7.4835	41.75	37.45
Vivo	G	1	2d Post	45	6.5	7.4625	44.7	39.05
Vivo	G	1	3d Post					
Vivo	GA	2	Start B1	34.5	6.5	7.424	48.65	38.25
Vivo	GA	2	End B1	33.5	6.6	7.4105	48.85	37.4
Vivo	GA	2	Start B2	34	6.65	7.3925	49.05	37.75
Vivo	GA	2	End B2	32	6.85	7.4105	50.05	32.55
Vivo	GA	2	Start B3	35.5	6.95	7.417	48.3	36.25
Vivo	GA	2	End B3	31.5	7	7.432	51.3	32.7

Horse	Diet	Period	Time	PCV- %	TS- g/dl	pH	pCO2- mmHg	pO2- mmHg
Vivo	GA	2	Start B4	30	6.65	7.419	48.5	33.45
Vivo	GA	2	End B4	33	6.5	7.4435	46.45	35.05
Vivo	GA	2	60 Post	29.5	6.4	7.418	48	33.9
Vivo	GA	2	1d Post	39	6.4	7.494	46.4	33.2
Vivo	GA	2	2d Post	36.5	6.5	7.5025	43.55	74.5
Vivo	GA	2	3d Post	34.5	6.2	7.4715	45.65	34.6
Vivo	GM	3	Start B1	33	6.5	7.418	50.1	35.4
Vivo	GM	3	End B1	30	6.6	7.4105	50.1	37
Vivo	GM	3	Start B2	33	7.05	7.407	49.1	37.15
Vivo	GM	3	End B2	34.5	6.95	7.424	51.15	35.05
Vivo	GM	3	Start B3	35	7	7.438	47.35	38.75
Vivo	GM	3	End B3	32.5	6.6	7.4445	49.35	40.75
Vivo	GM	3	Start B4	29.5	6.6	7.4415	47.2	34.8
Vivo	GM	3	End B4	32.5	6.6	7.449	48.55	37.3
Vivo	GM	3	60 Post	30.5	6.9	7.441	50.35	32.5
Vivo	GM	3	1d Post	33	6.6	7.4775	46.85	40.25
Vivo	GM	3	2d Post	34	6.6	7.46	44	38.05
Vivo	GM	3	3d Post	34	6.6	7.4615	45.15	38.85

Horse	Diet	Period	Time	Na- mmol/L	K- mmol/L	Cl- mmol/L	Ca- mg/dL	Mg- mg/dL
Amici	GM	1	Start B1	136.00	4.15	102.05	6.73	1.35
Amici	GM	1	End B1	136.65	3.51	101.60	6.37	1.30
Amici	GM	1	Start B2	139.60	3.37	98.50	6.63	1.25
Amici	GM	1	End B2	137.75	3.32	101.70	6.42	1.21
Amici	GM	1	Start B3	143.10	3.48	99.00	7.38	1.32
Amici	GM	1	End B3	139.75	3.71	101.90	6.72	1.28
Amici	GM	1	Start B4	139.80	3.62	102.20	6.83	1.30
Amici	GM	1	End B4	137.90	3.29	105.95	5.81	1.20
Amici	GM	1	60 Post	140.50	3.58	105.50	6.66	1.27
Amici	GM	1	1d Post	137.80	3.26	101.95	6.31	1.39
Amici	GM	1	2d Post	132.60	4.36	104.35	6.54	1.30
Amici	GM	1	3d Post	138.95	3.57	100.95	5.90	1.04
Amici	G	2	Start B1	140.20	3.28	101.90	5.76	0.96
Amici	G	2	End B1	140.95	3.39	102.55	5.64	0.92
Amici	G	2	Start B2	141.10	3.15	101.00	5.99	0.99
Amici	G	2	End B2	142.80	3.02	101.05	5.66	0.82
Amici	G	2	Start B3	143.75	3.04	101.85	6.52	0.99
Amici	G	2	End B3	144.20	3.37	101.90	5.86	0.90
Amici	G	2	Start B4					
Amici	G	2	End B4					
Amici	G	2	60 Post	143.90	3.33	102.65	6.47	0.96
Amici	G	2	1d Post	141.05	4.03		5.83	0.85
Amici	G	2	2d Post	138.95	3.70	103.00	6.17	0.97
Amici	G	2	3d Post	138.45	4.31	100.75	6.39	1.09
Avanti	GA	1	Start B1	134.90	3.47	103.60	6.43	1.05
Avanti	GA	1	End B1	136.10	3.35	103.40	6.23	1.02
Avanti	GA	1	Start B2	138.25	3.41	101.40	6.47	1.09
Avanti	GA	1	End B2	137.65	3.37	103.50	6.44	1.00
Avanti	GA	1	Start B3	140.40	3.67	104.30	6.91	1.16
Avanti	GA	1	End B3	140.30	3.79	102.15	6.75	1.08
Avanti	GA	1	Start B4	139.85	3.64	103.70	6.85	1.10
Avanti	GA	1	End B4	138.45	3.63	103.80	6.42	1.06
Avanti	GA	1	60 Post	142.20	3.55	99.40	7.14	1.15
Avanti	GA	1	1d Post	137.70	3.85	99.95	6.47	1.04
Avanti	GA	1	2d Post	138.15	3.99	103.05	6.22	1.20
Avanti	GA	1	3d Post	138.35	4.00	102.30	6.63	1.50
Avanti	GM	2	Start B1	141.10	3.66	104.15	6.13	0.99
Avanti	GM	2	End B1	140.50	3.46	102.00	6.27	0.98
Avanti	GM	2	Start B2	139.60	3.48	102.35	6.37	0.96
Avanti	GM	2	End B2	140.45	3.49	101.05	6.01	0.93
Avanti	GM	2	Start B3	141.25	3.22	102.65	6.37	0.99
Avanti	GM	2	End B3	140.00	3.42	101.40	6.09	0.87
Avanti	GM	2	Start B4	138.20	3.15	101.60	6.11	0.92
Avanti	GM	2	End B4	140.05	3.28	101.30	5.45	0.78
Avanti	GM	2	60 Post	142.25	2.63	102.90	5.58	0.75
Avanti	GM	2	1d Post	139.40	3.74	101.70	5.91	0.80

Horse	Diet	Period	Time	Na- mmol/L	K- mmol/L	Cl- mmol/L	Ca- mg/dL	Mg- mg/dL
Avanti	GM	2	2d Post	139.20		103.20	6.11	0.97
Avanti	GM	2	3d Post	138.85	3.95		6.36	1.10
Avanti	G	3	Start B1	140.15	3.60	103.65	6.13	1.15
Avanti	G	3	End B1	138.55	3.58	100.40	6.24	1.11
Avanti	G	3	Start B2	138.05	3.43	100.55	6.26	1.11
Avanti	G	3	End B2	138.90	3.22	99.95	6.06	1.07
Avanti	G	3	Start B3	139.85	3.17	102.75	6.34	1.09
Avanti	G	3	End B3	139.20	3.44	101.65	6.19	1.07
Avanti	G	3	Start B4	138.30	3.39	101.90	6.31	1.09
Avanti	G	3	End B4	138.00	3.23	100.90	5.92	1.06
Avanti	G	3	60 Post	140.10	2.99	102.15	6.42	1.09
Avanti	G	3	1d Post	139.00	3.46	102.00	6.14	1.09
Avanti	G	3	2d Post	138.65	3.66	104.25	5.88	0.97
Avanti	G	3	3d Post					
RePlay	GM	1	Start B1	139.25	3.67	101.05	6.56	1.05
RePlay	GM	1	End B1	136.00	3.63	103.95	5.96	1.03
RePlay	GM	1	Start B2	137.65	3.42	104.40	6.12	1.04
RePlay	GM	1	End B2	138.25	3.17	104.30	5.81	0.94
RePlay	GM	1	Start B3	140.55	3.25	104.25	6.39	1.08
RePlay	GM	1	End B3	139.30	3.54	104.90	6.17	1.03
RePlay	GM	1	Start B4	141.65	3.23	103.35	6.48	1.02
RePlay	GM	1	End B4	139.50	3.32	104.85	6.11	1.02
RePlay	GM	1	60 Post	141.20	3.38	103.85	6.84	1.10
RePlay	GM	1	1d Post	138.70	3.65	105.05	6.53	1.02
RePlay	GM	1	2d Post	136.70	4.12	101.50	6.59	1.13
RePlay	GM	1	3d Post	136.65	4.28	102.10	6.57	1.14
RePlay	G	2	Start B1	141.80	4.57	102.15	6.64	
RePlay	G	2	End B1	140.80	3.99	101.75	6.23	1.07
RePlay	G	2	Start B2	139.35	3.91	102.35	6.78	1.14
RePlay	G	2	End B2	141.05	3.45	102.10	6.41	1.08
RePlay	G	2	Start B3	141.70	3.67	102.65	6.58	1.13
RePlay	G	2	End B3	141.00	3.50	101.50	6.12	1.05
RePlay	G	2	Start B4	139.95	3.40	101.45	6.53	1.07
RePlay	G	2	End B4	141.55	3.38	100.80	6.10	1.06
RePlay	G	2	60 Post	144.80	3.20	100.40	6.53	1.05
RePlay	G	2	1d Post	139.20	3.80	101.20	6.35	1.04
RePlay	G	2	2d Post	140.55	3.17	100.00	6.22	1.01
RePlay	G	2	3d Post	140.00	3.07	99.60	6.32	1.05
RePlay	GA	3	Start B1	142.00	4.10	102.65	6.63	1.45
RePlay	GA	3	End B1	141.45	3.69	102.90	6.33	1.33
RePlay	GA	3	Start B2	140.40	3.60	103.55	6.77	1.36
RePlay	GA	3	End B2	141.40	3.49	103.95	6.22	1.25
RePlay	GA	3	Start B3	142.30	3.80	104.00	6.63	1.43
RePlay	GA	3	End B3	142.20	3.59	103.20	6.10	1.23
RePlay	GA	3	Start B4	140.50	3.48	104.10	6.62	1.36

Horse	Diet	Period	Time	Na-mmol/L	K-mmol/L	Cl-mmol/L	Ca-mg/dL	Mg-mg/dL
RePlay	GA	3	End B4	142.40	3.41	101.45	6.25	1.25
RePlay	GA	3	60 Post	143.45	3.58	103.65	6.68	1.42
RePlay	GA	3	1d Post	141.60	3.69	101.90	6.25	1.18
RePlay	GA	3	2d Post	138.85	4.11	100.85	6.34	1.28
RePlay	GA	3	3d Post	140.85	3.81	100.75	5.83	1.05
Showtime	G	1	Start B1	142.75	3.86	103.70	7.49	1.04
Showtime	G	1	End B1	141.10	3.66	103.60	6.58	1.06
Showtime	G	1	Start B2	139.00	3.51	105.20	6.47	1.06
Showtime	G	1	End B2	138.40	3.36	105.85	6.03	0.97
Showtime	G	1	Start B3	141.80	3.74	108.05	6.63	1.13
Showtime	G	1	End B3	137.30	3.56	103.15	6.17	1.03
Showtime	G	1	Start B4	137.45	3.55	103.20	6.61	1.09
Showtime	G	1	End B4	139.05	3.54	102.60	6.13	1.00
Showtime	G	1	60 Post	141.40	2.54	105.00	6.35	0.98
Showtime	G	1	1d Post	138.10	3.51	103.60	6.04	0.93
Showtime	G	1	2d Post	138.85	3.85	102.20	6.42	1.06
Showtime	G	1	3d Post	136.90	3.28	104.45	6.14	1.02
Showtime	GA	2	Start B1	136.80	3.50	118.70	6.16	1.03
Showtime	GA	2	End B1	136.55	3.01	108.65	5.97	1.02
Showtime	GA	2	Start B2	141.50	2.97	102.45	6.78	1.07
Showtime	GA	2	End B2	138.35	2.87	102.90	6.51	1.10
Showtime	GA	2	Start B3	136.80	2.64	107.85	6.23	1.06
Showtime	GA	2	End B3	138.40	3.12	101.85	6.71	1.10
Showtime	GA	2	Start B4	133.25	2.92	108.15	6.37	1.13
Showtime	GA	2	End B4	140.65	2.89	98.20	6.13	1.00
Showtime	GA	2	60 Post	140.00	2.64	102.70	6.48	1.01
Showtime	GA	2	1d Post	138.90	4.88	99.10	6.22	1.00
Showtime	GA	2	2d Post	138.65	4.65	103.85	6.94	1.32
Showtime	GA	2	3d Post					
Showtime	GM	3	Start B1	140.40	3.38	100.20	6.32	1.31
Showtime	GM	3	End B1	140.50	2.97	101.60	5.83	1.21
Showtime	GM	3	Start B2	141.25	2.96	102.10	6.33	1.26
Showtime	GM	3	End B2	142.45	2.99	101.55	5.89	1.23
Showtime	GM	3	Start B3	144.95	3.17	104.50	6.29	1.23
Showtime	GM	3	End B3	142.95	3.10	101.45	6.21	1.22
Showtime	GM	3	Start B4	141.95	3.00	102.30	6.51	1.24
Showtime	GM	3	End B4	141.40	2.89	101.15	5.77	1.17
Showtime	GM	3	60 Post	143.45	3.00	102.45	6.39	1.28
Showtime	GM	3	1d Post	140.25	3.66	99.20	6.34	1.32
Showtime	GM	3	2d Post	141.40	3.37	100.25		1.23
Showtime	GM	3	3d Post	139.90	3.58	102.00	6.20	1.23
Sully	GA	1	Start B1	135.60	3.96	102.95	6.28	1.17
Sully	GA	1	End B1	138.65	3.65	101.65	6.05	1.14
Sully	GA	1	Start B2	138.95	3.48	98.45	6.90	1.22
Sully	GA	1	End B2	138.00	3.56	101.25	6.23	1.13
Sully	GA	1	Start B3	140.05	3.70	103.25	7.13	1.22
Sully	GA	1	End B3	138.05	3.54	102.70	6.82	1.19

Horse	Diet	Period	Time	Na-mmol/L	K-mmol/L	Cl-mmol/L	Ca-mg/dL	Mg-mg/dL
Sully	GA	1	Start B4	138.95	3.51	101.60	6.98	1.21
Sully	GA	1	End B4	138.65	3.42	102.15	5.97	1.08
Sully	GA	1	60 Post	140.05	3.65	103.70	6.66	1.15
Sully	GA	1	1d Post	139.40	2.42	97.05	6.30	1.05
Sully	GA	1	2d Post	135.00	3.65	99.10	6.18	1.00
Sully	GA	1	3d Post	135.65	3.89	102.00	6.39	1.04
Sully	GM	2	Start B1	139.65	3.69	99.10	6.74	1.21
Sully	GM	2	End B1	141.40	3.23	100.95	5.79	1.11
Sully	GM	2	Start B2	141.75	2.97	98.20	6.36	1.10
Sully	GM	2	End B2	146.00	2.91	96.00	5.88	0.97
Sully	GM	2	Start B3	143.10	2.98	101.65	6.60	1.11
Sully	GM	2	End B3	143.95	3.02	99.05	6.16	1.12
Sully	GM	2	Start B4	148.20	2.92	93.70	6.79	1.14
Sully	GM	2	End B4	139.15	2.94	102.15	5.25	1.00
Sully	GM	2	60 Post	143.35	2.77	97.90	6.16	1.17
Sully	GM	2	1d Post					
Sully	GM	2	2d Post	140.25	4.14	96.10	6.45	1.13
Sully	GM	2	3d Post	138.50	4.14	100.25	6.30	1.13
Sully	G	3	Start B1	142.15	3.29	101.15	6.02	1.18
Sully	G	3	End B1	141.05	3.39	101.30	6.19	1.19
Sully	G	3	Start B2	140.10	3.29	102.10	6.64	1.26
Sully	G	3	End B2	141.30	3.18	100.80	5.69	1.13
Sully	G	3	Start B3	142.20	3.28	101.55	6.16	1.16
Sully	G	3	End B3	141.75	3.12	101.60	5.77	1.08
Sully	G	3	Start B4	141.50	2.83	102.40	5.88	1.08
Sully	G	3	End B4	141.40	2.99	101.25	5.52	1.05
Sully	G	3	60 Post	142.50	3.09	101.40	6.22	1.16
Sully	G	3	1d Post	138.60	3.48	100.05	6.04	1.19
Sully	G	3	2d Post	138.95	3.87	101.15	6.07	1.15
Sully	G	3	3d Post	140.95	3.73	104.25	6.23	1.17
Vivo	G	1	Start B1	137.35	4.26	104.05	6.61	1.06
Vivo	G	1	End B1	138.95	3.61	102.50	6.41	1.03
Vivo	G	1	Start B2	139.10	3.53	103.50	6.43	0.99
Vivo	G	1	End B2	138.00	3.74	103.85	6.25	0.96
Vivo	G	1	Start B3	138.20	3.81	104.60	6.37	1.02
Vivo	G	1	End B3	138.15	3.77	104.10	6.28	1.02
Vivo	G	1	Start B4	138.20	3.42	103.20	6.67	1.11
Vivo	G	1	End B4	138.00	3.50	102.55	6.22	0.98
Vivo	G	1	60 Post	138.80	3.36	102.65	6.81	1.07
Vivo	G	1	1d Post	134.35	3.60	103.10	6.26	0.87
Vivo	G	1	2d Post	137.50	4.26	104.20	6.34	1.06
Vivo	G	1	3d Post					
Vivo	GA	2	Start B1	141.15	3.97	102.15	6.37	1.08
Vivo	GA	2	End B1	141.15	3.72	102.45	6.36	1.02
Vivo	GA	2	Start B2	140.20	3.56	102.70	6.73	1.10
Vivo	GA	2	End B2	141.40	3.50	101.95	6.12	0.98
Vivo	GA	2	Start B3	141.70	3.84	103.20	6.57	1.12
Vivo	GA	2	End B3	140.35	3.90	101.15	6.22	1.02

Horse	Diet	Period	Time	Na-mmol/L	K-mmol/L	Cl-mmol/L	Ca-mg/dL	Mg-mg/dL
Vivo	GA	2	Start B4	137.95	3.60	102.15	6.59	1.08
Vivo	GA	2	End B4	139.00	3.55	100.75	6.01	0.99
Vivo	GA	2	60 Post	141.25	3.60	102.00	6.46	0.98
Vivo	GA	2	1d Post	137.65	3.77	97.55	6.25	0.93
Vivo	GA	2	2d Post	138.20	4.36	98.70	6.14	1.28
Vivo	GA	2	3d Post	137.50	3.97	99.55	5.85	0.91
Vivo	GM	3	Start B1	139.90	4.03	102.85	6.55	1.27
Vivo	GM	3	End B1	140.85	3.60	100.85	6.34	1.26
Vivo	GM	3	Start B2	141.15	3.39	100.40	6.66	1.30
Vivo	GM	3	End B2	141.40	3.70	103.15	6.30	1.23
Vivo	GM	3	Start B3	143.25	3.72	104.80	6.56	1.25
Vivo	GM	3	End B3	141.65	3.74	101.80	6.25	1.23
Vivo	GM	3	Start B4	140.15	3.52	103.50	6.49	1.18
Vivo	GM	3	End B4	140.40	3.55	102.30	6.21	1.23
Vivo	GM	3	60 Post	141.70	3.13	102.15	6.57	1.18
Vivo	GM	3	1d Post	138.00	3.47	100.35	6.25	1.13
Vivo	GM	3	2d Post	138.45	3.70	103.20	6.37	1.15
Vivo	GM	3	3d Post	138.20	3.82	102.15	6.40	1.12

Horse	Diet	Period	Time	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L	HCO3-mmol/L
Amici	GM	1	Start B1	132.5	0.65	13	11.35	36.30
Amici	GM	1	End B1	125	1.35	13.5	11.00	35.95
Amici	GM	1	Start B2	128.5	1.50	13.5	10.20	34.50
Amici	GM	1	End B2	131.5	1.15	15	11.85	36.75
Amici	GM	1	Start B3	138.5	1.65	15.5	9.55	34.90
Amici	GM	1	End B3	133.5	1.05	16	8.85	34.40
Amici	GM	1	Start B4	130	1.45	16	8.50	33.15
Amici	GM	1	End B4	131	1.55	16.5	11.35	36.45
Amici	GM	1	60 Post	127.5	2.00	17	8.80	34.10
Amici	GM	1	1d Post	107.5	0.90	14	10.30	35.15
Amici	GM	1	2d Post	108	0.70	13.5	8.60	33.70
Amici	GM	1	3d Post	99.5	0.35	13	8.30	33.05
Amici	G	2	Start B1	112	0.00	16	9.05	33.85
Amici	G	2	End B1	127.5	0.00	16	9.65	34.10
Amici	G	2	Start B2	124	0.20	17	10.20	34.80
Amici	G	2	End B2	112	0.60	16.5	9.45	33.85
Amici	G	2	Start B3	138.5	1.20	17.5	10.00	34.55
Amici	G	2	End B3	132	0.75	17.5	10.35	35.25
Amici	G	2	Start B4					
Amici	G	2	End B4					
Amici	G	2	60 Post	136	1.25	18	8.40	32.95
Amici	G	2	1d Post	114.5	0.20	13	10.00	34.20
Amici	G	2	2d Post	103	0.25	20.5	7.70	31.85
Amici	G	2	3d Post	102.5	0.15	21.5	10.00	34.75
Avanti	GA	1	Start B1	132	7.70	20	8.95	33.05
Avanti	GA	1	End B1	113	0.80	21	8.30	32.40
Avanti	GA	1	Start B2	119	1.30	20.5	7.50	30.85
Avanti	GA	1	End B2	123	1.10	21.5	7.30	31.50
Avanti	GA	1	Start B3	159.5	2.90	23	5.15	29.30
Avanti	GA	1	End B3	122	0.50	23.5	7.70	32.05
Avanti	GA	1	Start B4	123.5	1.00	23.5	7.75	32.10
Avanti	GA	1	End B4	120	0.90	23.5	6.70	30.90
Avanti	GA	1	60 Post	157.5	1.70	26	6.35	30.95
Avanti	GA	1	1d Post	115	0.90	18	10.15	34.35
Avanti	GA	1	2d Post	114	1.10	18.5	8.40	33.30
Avanti	GA	1	3d Post	112.5	0.80	17	9.20	34.15
Avanti	GM	2	Start B1	162.5	0.30	13	7.90	32.65
Avanti	GM	2	End B1	139	0.60	13.5	7.90	32.70
Avanti	GM	2	Start B2	150	0.90	13.5	6.80	31.35
Avanti	GM	2	End B2	137.5	0.30	14.5	9.00	33.65
Avanti	GM	2	Start B3	149.5	0.75	16	7.50	32.15
Avanti	GM	2	End B3	128.5	0.05	15.5	8.70	33.30
Avanti	GM	2	Start B4	136	0.10	15	7.20	31.45
Avanti	GM	2	End B4	137.5	0.80	15.5	9.20	33.50
Avanti	GM	2	60 Post	138.5	0.15	17	8.45	33.15
Avanti	GM	2	1d Post	127	0.70	12.5	8.10	32.00
Avanti	GM	2	2d Post	120	0.75	12	6.25	30.00

Horse	Diet	Period	Time	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L	HCO3-mmol/L
Avanti	GM	2	3d Post	108	1.85	17	10.80	35.30
Avanti	G	3	Start B1	131	0.35	17.5	10.90	35.45
Avanti	G	3	End B1	116.5	0.40	17.5	11.20	36.10
Avanti	G	3	Start B2	119.5	0.55	17	10.40	35.15
Avanti	G	3	End B2	119	0.30	17.5	11.40	36.15
Avanti	G	3	Start B3	134.5	1.20	18	10.25	34.90
Avanti	G	3	End B3	115.5	0.35	18.5	10.50	35.20
Avanti	G	3	Start B4	124	0.70	19	9.00	33.60
Avanti	G	3	End B4	124.5	0.70	18	9.75	34.50
Avanti	G	3	60 Post	135	1.25	19	9.75	34.70
Avanti	G	3	1d Post	123.5	2.05	12.5	9.00	32.80
Avanti	G	3	2d Post	112.5	0.50	14	7.25	31.15
Avanti	G	3	3d Post					
RePlay	GM	1	Start B1	127	0.60	14	8.75	33.10
RePlay	GM	1	End B1	117.5	0.60	14.5	10.25	34.15
RePlay	GM	1	Start B2	127	0.60	14	6.80	27.70
RePlay	GM	1	End B2	133.5	0.70	15	8.00	31.70
RePlay	GM	1	Start B3	156.5	1.60	16	6.35	30.30
RePlay	GM	1	End B3	121.5	0.50	16	10.05	34.30
RePlay	GM	1	Start B4	126	0.85	16	6.65	30.90
RePlay	GM	1	End B4	123	0.60	16	9.55	33.80
RePlay	GM	1	60 Post	155.5	1.60	17	7.05	31.45
RePlay	GM	1	1d Post	112.5	0.70	12	5.40	29.35
RePlay	GM	1	2d Post	106.5	0.65	14	8.05	32.55
RePlay	GM	1	3d Post	104.5	0.40	14	9.00	33.65
RePlay	G	2	Start B1	135	0.50	15.5	8.35	33.50
RePlay	G	2	End B1	132.5	0.70	16	6.50	31.05
RePlay	G	2	Start B2	138.5	1.10	16	5.15	30.00
RePlay	G	2	End B2	105.5	1.60	17	6.40	31.35
RePlay	G	2	Start B3	143.5	2.00	17	6.70	31.60
RePlay	G	2	End B3	120.5	0.10	17	8.70	33.20
RePlay	G	2	Start B4	123.5	0.55	17.5	7.30	31.75
RePlay	G	2	End B4	128.5	0.45	17.5	10.10	34.65
RePlay	G	2	60 Post	148	1.35	18	8.20	32.85
RePlay	G	2	1d Post	104	1.05	14	8.70	33.45
RePlay	G	2	2d Post	100.5	0.40	16.5	9.00	33.80
RePlay	G	2	3d Post	110	0.65	15	8.85	33.55
RePlay	GA	3	Start B1	130.5	0.70	22	7.60	32.60
RePlay	GA	3	End B1	114.5	0.50	22	8.10	32.90
RePlay	GA	3	Start B2	126.5	1.20	22	6.30	31.10
RePlay	GA	3	End B2	116.5	0.70	21.5	7.80	32.40
RePlay	GA	3	Start B3	146.5	1.60	23.5	8.40	33.55
RePlay	GA	3	End B3	110.5	0.55	22	7.55	32.15
RePlay	GA	3	Start B4	119	1.05	23	6.10	30.90
RePlay	GA	3	End B4	121.5	1.05	24.5	8.90	33.40
RePlay	GA	3	60 Post	133.5	1.95	23.5	8.45	33.30
RePlay	GA	3	1d Post	103	1.00	18	8.30	33.00
RePlay	GA	3	2d Post	98.5	0.50	20.5	10.45	35.15

Horse	Diet	Period	Time	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L	HCO3-mmol/L
RePlay	GA	3	3d Post	97.5	0.50	18.5	7.85	32.70
Showtime	G	1	Start B1	127	0.80	15	6.30	30.95
Showtime	G	1	End B1	118.5	1.10	15	4.10	28.55
Showtime	G	1	Start B2	125	1.60	14	2.60	27.15
Showtime	G	1	End B2	132	0.70	15	5.95	30.55
Showtime	G	1	Start B3	152	1.65	16	3.55	28.15
Showtime	G	1	End B3	121.5	0.70	15	6.00	30.65
Showtime	G	1	Start B4	130	1.30	15	4.85	29.25
Showtime	G	1	End B4	136	1.50	16	5.55	29.75
Showtime	G	1	60 Post	147	2.35	17	7.15	31.20
Showtime	G	1	1d Post	119.5	1.75	14	8.05	31.70
Showtime	G	1	2d Post	121.5	2.45	14	6.20	30.30
Showtime	G	1	3d Post	116.5	0.55	14	6.40	30.45
Showtime	GA	2	Start B1	139.5	1.55	16.5	9.35	33.90
Showtime	GA	2	End B1	136.5	1.40	18	10.10	34.75
Showtime	GA	2	Start B2	138	2.00	19	6.45	31.40
Showtime	GA	2	End B2	137	1.70	18.5	8.20	33.15
Showtime	GA	2	Start B3	142.5	2.35	19	9.50	34.10
Showtime	GA	2	End B3	142	1.40	20	9.55	34.25
Showtime	GA	2	Start B4	145	2.30	19	8.80	33.40
Showtime	GA	2	End B4	148.5	1.20	20	8.70	33.00
Showtime	GA	2	60 Post	142	1.60	20.5	9.35	33.65
Showtime	GA	2	1d Post	115.5	2.40	16	11.45	36.15
Showtime	GA	2	2d Post	125	1.35	17	8.85	33.40
Showtime	GA	2	3d Post					
Showtime	GM	3	Start B1	162	1.40	11	9.75	34.55
Showtime	GM	3	End B1	156	1.30	11	8.05	32.40
Showtime	GM	3	Start B2	154.5	1.80	12	6.75	31.40
Showtime	GM	3	End B2	131	1.20	12	7.75	32.30
Showtime	GM	3	Start B3	147.5	2.00	13	7.80	31.95
Showtime	GM	3	End B3	149	1.30	13.5	7.25	31.85
Showtime	GM	3	Start B4	147.5	2.20	15	5.85	30.55
Showtime	GM	3	End B4	147	2.35	14	9.10	33.50
Showtime	GM	3	60 Post	145.5	3.00	15.5	7.80	32.05
Showtime	GM	3	1d Post	119.5	1.65	12	10.55	34.65
Showtime	GM	3	2d Post	110.5	1.20	13	9.15	33.70
Showtime	GM	3	3d Post	109	0.70	12	8.45	32.80
Sully	GA	1	Start B1	130	0.65	17	7.35	31.95
Sully	GA	1	End B1	105.5	0.70	17	8.80	33.70
Sully	GA	1	Start B2	110.5	1.00	18	6.60	31.65
Sully	GA	1	End B2	110	0.75	18	6.80	31.35
Sully	GA	1	Start B3	123	1.65	18.5	6.95	31.75
Sully	GA	1	End B3	103.5	0.85	19	6.90	31.85
Sully	GA	1	Start B4	104	0.95	19	6.30	31.35
Sully	GA	1	End B4	98.5	0.70	18.5	8.15	32.50
Sully	GA	1	60 Post	110	1.60	18.5	7.95	32.20
Sully	GA	1	1d Post	109	0.90	17	9.20	33.50
Sully	GA	1	2d Post	100.5	0.55	16	10.30	35.25

Horse	Diet	Period	Time	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L	HCO3-mmol/L
Sully	GA	1	3d Post	102.5	0.20	14	8.70	33.10
Sully	GM	2	Start B1	146	0.40	10	10.85	36.15
Sully	GM	2	End B1	128.5	0.30	10.5	10.40	35.50
Sully	GM	2	Start B2	137.5	0.70	11	9.50	34.55
Sully	GM	2	End B2	118	0.60	11.5	9.30	34.25
Sully	GM	2	Start B3	135.5	1.15	12	10.50	35.75
Sully	GM	2	End B3	123	0.65	12	10.45	35.15
Sully	GM	2	Start B4	122.5	1.40	13	8.40	33.70
Sully	GM	2	End B4	125	0.80	13	11.90	36.50
Sully	GM	2	60 Post	136	1.55	14	13.00	37.60
Sully	GM	2	1d Post					
Sully	GM	2	2d Post	111	0.70	11.5	9.00	34.30
Sully	GM	2	3d Post	102	0.75	10	7.85	33.30
Sully	G	3	Start B1	114.5	0.60	16	9.75	35.50
Sully	G	3	End B1	113.5	0.85	16.5	6.65	31.45
Sully	G	3	Start B2	116.5	1.05	16.5	5.70	30.75
Sully	G	3	End B2	113	0.85	16.5	8.60	33.55
Sully	G	3	Start B3	127	1.55	16	8.45	32.60
Sully	G	3	End B3	115	0.75	16	9.60	34.40
Sully	G	3	Start B4	112.5	1.00	16	8.50	33.00
Sully	G	3	End B4	120	1.90	16	9.35	34.10
Sully	G	3	60 Post	139	2.15	16	10.05	35.10
Sully	G	3	1d Post	115	1.85	12.5	9.80	34.45
Sully	G	3	2d Post	101.5	0.80	14	9.75	34.40
Sully	G	3	3d Post	140	0.60	14	7.85	32.35
Vivo	G	1	Start B1	123	0.85	20.5	4.90	26.35
Vivo	G	1	End B1	103	1.00	21	6.80	31.05
Vivo	G	1	Start B2	101.5	1.00	21	5.60	29.85
Vivo	G	1	End B2	110.5	1.00	21.5	5.00	28.80
Vivo	G	1	Start B3	129	1.50	22.5	4.70	28.75
Vivo	G	1	End B3	112.5	0.60	24	6.15	30.40
Vivo	G	1	Start B4	113.5	0.80	24	3.20	27.15
Vivo	G	1	End B4	129	0.60	24.5	5.10	29.05
Vivo	G	1	60 Post	133	1.00	26	4.90	28.90
Vivo	G	1	1d Post	106	1.20	21	8.00	31.55
Vivo	G	1	2d Post	106.5	0.90	19	7.95	32.20
Vivo	G	1	3d Post					
Vivo	GA	2	Start B1	122	0.75	22.5	7.25	32.05
Vivo	GA	2	End B1	113	0.50	23.5	6.20	31.15
Vivo	GA	2	Start B2	115.5	1.30	23.5	4.95	30.05
Vivo	GA	2	End B2	118	0.60	23.5	6.90	32.00
Vivo	GA	2	Start B3	132.5	1.70	25	6.45	31.30
Vivo	GA	2	End B3	113	0.30	25.5	9.35	34.35
Vivo	GA	2	Start B4	120	1.20	25	6.80	31.55
Vivo	GA	2	End B4	110	0.50	25	7.60	31.95
Vivo	GA	2	60 Post	128.5	1.95	26.5	6.50	31.15
Vivo	GA	2	1d Post	108.5	1.30	21.5	11.75	35.85
Vivo	GA	2	2d Post	104.5	0.20	22	10.75	34.35

Horse	Diet	Period	Time	glucose-mg/dL	lactate-mmol/L	BUN-mg/dL	BE-B-mmol/L	HCO3-mmol/L
Vivo	GA	2	3d Post	97	0.00	22	9.35	33.50
Vivo	GM	3	Start B1	123.5	0.85	17	7.60	32.50
Vivo	GM	3	End B1	116.5	0.30	18	6.90	31.95
Vivo	GM	3	Start B2	118.5	0.60	18	6.05	31.10
Vivo	GM	3	End B2	120.5	0.55	19	8.70	33.70
Vivo	GM	3	Start B3	133.5	1.75	18.5	7.65	32.25
Vivo	GM	3	End B3	115.5	0.30	19	9.40	34.05
Vivo	GM	3	Start B4	113	1.00	18.5	7.95	32.35
Vivo	GM	3	End B4	122.5	0.75	20	9.35	33.85
Vivo	GM	3	60 Post	118	1.75	20.5	9.75	34.45
Vivo	GM	3	1d Post	107.5	1.15	17.5	10.80	34.95
Vivo	GM	3	2d Post	114.5	0.95	18.5	7.50	31.50
Vivo	GM	3	3d Post	110	0.55	18	8.45	32.45

Horse	Diet	Period	Time	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg	m. osm-mOsm/kg
Amici	GM	1	Start B1	6.91	1.37	7.10	274	269
Amici	GM	1	End B1	6.55	1.32	7.70	275	271
Amici	GM	1	Start B2	6.79	1.27	9.90	281	271
Amici	GM	1	End B2	6.60	1.23	11.40	278	276
Amici	GM	1	Start B3	7.49	1.33	12.70	289	274
Amici	GM	1	End B3	6.77	1.29	7.15	282	280
Amici	GM	1	Start B4	7.00	1.31	8.05	282	281
Amici	GM	1	End B4	5.97	1.22	6.80	279	276
Amici	GM	1	60 Post	6.74	1.28	11.70	284	281
Amici	GM	1	1d Post	6.40	1.15	4.70	275	269
Amici	GM	1	2d Post	6.64	1.31	6.20	266	271
Amici	GM	1	3d Post	6.01	1.05	8.50	278	268
Amici	G	2	Start B1	5.88	0.97	7.75	282	268
Amici	G	2	End B1	5.83	0.93	7.70	284	271
Amici	G	2	Start B2	6.20	1.01	8.50	284	271
Amici	G	2	End B2	5.85	0.84	10.95	287	274
Amici	G	2	Start B3	6.69	1.01	10.40	290	281
Amici	G	2	End B3	6.02	0.91	10.45	291	278
Amici	G	2	Start B4					
Amici	G	2	End B4					
Amici	G	2	60 Post	6.63	0.97	11.60	291	274
Amici	G	2	1d Post	6.07	0.87		283	267
Amici	G	2	2d Post	6.35	0.98	7.75	281	267
Amici	G	2	3d Post	6.57	1.11	7.25	280	270
Avanti	GA	1	Start B1	6.67	1.07	5.10	275	274
Avanti	GA	1	End B1	6.43	1.04	8.80	276	274
Avanti	GA	1	Start B2	6.79	1.12	9.40	280	275
Avanti	GA	1	End B2	6.63	1.01	6.05	280	275
Avanti	GA	1	Start B3	7.05	1.17	10.40	287	284
Avanti	GA	1	End B3	6.94	1.10	9.90	285	277
Avanti	GA	1	Start B4	7.04	1.12	7.70	284	282
Avanti	GA	1	End B4	6.58	1.07	7.35	282	285
Avanti	GA	1	60 Post	7.25	1.16	15.40	292	287
Avanti	GA	1	1d Post	6.75	1.06	7.25	278	271
Avanti	GA	1	2d Post	6.35	1.22	5.85	279	275
Avanti	GA	1	3d Post	6.70	1.28	6.00	279	275
Avanti	GM	2	Start B1	6.24	1.00	8.00	286	271
Avanti	GM	2	End B1	6.38	0.99	9.25	283	272
Avanti	GM	2	Start B2	6.48	0.97	9.35	282	269
Avanti	GM	2	End B2	6.18	0.94	9.25	283	270
Avanti	GM	2	Start B3	6.48	1.00	9.65	286	275
Avanti	GM	2	End B3	6.25	0.88	8.75	282	271
Avanti	GM	2	Start B4	6.27	0.93	8.25	280	268
Avanti	GM	2	End B4	5.64	0.80	8.50	283	274
Avanti	GM	2	60 Post	5.68	0.76	8.90	288	271
Avanti	GM	2	1d Post	6.15	0.82	9.50	280	269
Avanti	GM	2	2d Post	6.32	0.99	11.10	279	267

Horse	Diet	Period	Time	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg	m. osm-mOsm/kg
Avanti	GM	2	3d Post	6.59	1.12		279	0
Avanti	G	3	Start B1	6.34	1.18	4.70	283	274
Avanti	G	3	End B1	6.41	1.12	5.70	280	276
Avanti	G	3	Start B2	6.43	1.12	5.75	279	271
Avanti	G	3	End B2	6.26	1.09	6.00	281	273
Avanti	G	3	Start B3	6.52	1.10	5.30	283	273
Avanti	G	3	End B3	6.37	1.08	5.80	281	271
Avanti	G	3	Start B4	6.45	1.10	6.20	280	269
Avanti	G	3	End B4	6.08	1.08	5.85	279	272
Avanti	G	3	60 Post	6.54	1.10	6.25	284	276
Avanti	G	3	1d Post	6.36	1.12	7.65	279	270
Avanti	G	3	2d Post	6.09	0.98	6.90	278	269
Avanti	G	3	3d Post					
RePlay	GM	1	Start B1	6.77	1.07	8.75	280	272
RePlay	GM	1	End B1	6.25	1.05	1.55	274	273
RePlay	GM	1	Start B2	6.78	1.10	8.90	277	273
RePlay	GM	1	End B2	6.05	0.96	5.35	279	274
RePlay	GM	1	Start B3	6.58	1.09	9.25	285	275
RePlay	GM	1	End B3	6.39	1.05	8.90	281	276
RePlay	GM	1	Start B4	6.62	1.03	10.60	286	274
RePlay	GM	1	End B4	6.32	1.04	9.80	281	277
RePlay	GM	1	60 Post	6.96	1.11	9.25	286	276
RePlay	GM	1	1d Post	6.69	1.03	8.05	278	268
RePlay	GM	1	2d Post	6.75	1.14	6.80	275	268
RePlay	GM	1	3d Post	6.73	1.16	5.25	274	270
RePlay	G	2	Start B1	6.71	1.17	10.65	286	275
RePlay	G	2	End B1	6.32	1.08	12.00	284	275
RePlay	G	2	Start B2	6.81	1.14	10.95	282	276
RePlay	G	2	End B2	6.43	1.08	11.05	283	275
RePlay	G	2	Start B3	6.61	1.13	11.10	287	276
RePlay	G	2	End B3	6.28	1.06	9.80	284	275
RePlay	G	2	Start B4	6.66	1.08	10.15	283	273
RePlay	G	2	End B4	6.30	1.08	9.50	286	275
RePlay	G	2	60 Post	6.66	1.06	14.75	293	276
RePlay	G	2	1d Post	6.49	1.05	8.25	279	265
RePlay	G	2	2d Post	6.36	1.03	9.95	282	268
RePlay	G	2	3d Post	6.48	1.07	9.90	281	268
RePlay	GA	3	Start B1	6.70	1.46	10.85	289	275
RePlay	GA	3	End B1	6.43	1.34	9.30	287	274
RePlay	GA	3	Start B2	6.84	1.36	9.30	285	274
RePlay	GA	3	End B2	6.32	1.26	8.50	287	275
RePlay	GA	3	Start B3	6.66	1.44	8.50	290	277
RePlay	GA	3	End B3	6.22	1.24	10.45	288	279
RePlay	GA	3	Start B4	6.65	1.36	9.00	285	276
RePlay	GA	3	End B4	6.42	1.26	10.90	290	274
RePlay	GA	3	60 Post	6.78	1.43	10.10	292	279
RePlay	GA	3	1d Post	6.39	1.19	10.45	285	272
RePlay	GA	3	2d Post	6.49	1.30	6.95	280	272

Horse	Diet	Period	Time	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg	m. osm-mOsm/kg
RePlay	GA	3	3d Post	5.94	1.06	11.25	283	268
Showtime	G	1	Start B1	7.59	1.05	12.00	287	276
Showtime	G	1	End B1	6.63	1.07	12.55	283	276
Showtime	G	1	Start B2	6.46	1.06	10.20	280	274
Showtime	G	1	End B2	6.09	0.98	5.35	279	275
Showtime	G	1	Start B3	6.64	1.13	9.35	287	280
Showtime	G	1	End B3	6.25	1.03	7.00	277	271
Showtime	G	1	Start B4	6.68	1.09	8.55	278	272
Showtime	G	1	End B4	6.26	1.01	10.25	281	274
Showtime	G	1	60 Post	6.54	1.00	7.70	286	280
Showtime	G	1	1d Post	6.32	0.95	6.30	278	274
Showtime	G	1	2d Post	6.59	1.08	10.20	279	270
Showtime	G	1	3d Post	6.30	1.04	5.30	275	272
Showtime	GA	2	Start B1	6.32	1.04	7.20	278	276
Showtime	GA	2	End B1	6.14	1.04		277	273
Showtime	GA	2	Start B2	6.81	1.07	10.65	287	276
Showtime	GA	2	End B2	6.61	1.11	11.80	281	273
Showtime	GA	2	Start B3	6.39	1.08	2.60	279	274
Showtime	GA	2	End B3	6.89	1.12	14.50	281	275
Showtime	GA	2	Start B4	6.51	1.15		272	273
Showtime	GA	2	End B4	6.31	1.02	12.35	286	271
Showtime	GA	2	60 Post	6.68	1.03	13.60	285	276
Showtime	GA	2	1d Post	6.43	1.02	8.50	280	269
Showtime	GA	2	2d Post	7.12	1.34	6.05	280	271
Showtime	GA	2	3d Post					270
Showtime	GM	3	Start B1	6.43	1.32	9.05	283	273
Showtime	GM	3	End B1	5.96	1.22	9.45	283	273
Showtime	GM	3	Start B2	6.41	1.27	10.65	284	269
Showtime	GM	3	End B2	6.02	1.25	11.65	286	272
Showtime	GM	3	Start B3	6.48	1.25	11.70	292	279
Showtime	GM	3	End B3	6.32	1.24	12.70	288	274
Showtime	GM	3	Start B4	6.56	1.25	12.10	287	276
Showtime	GM	3	End B4	5.94	1.19	9.70	285	267
Showtime	GM	3	60 Post	6.52	1.29	11.95	290	279
Showtime	GM	3	1d Post	6.61	1.36	10.00	281	269
Showtime	GM	3	2d Post	6.36	1.25	10.85	283	268
Showtime	GM	3	3d Post	6.34	1.25	8.65	280	269
Sully	GA	1	Start B1	6.41	1.19	11.20	275	276
Sully	GA	1	End B1	6.18	1.15	6.90	279	275
Sully	GA	1	Start B2	6.94	1.22	12.35	280	271
Sully	GA	1	End B2	6.34	1.14	8.95	278	275
Sully	GA	1	Start B3	7.22	1.23	8.80	283	279
Sully	GA	1	End B3	6.89	1.20	7.05	278	275
Sully	GA	1	Start B4	7.02	1.21	9.50	280	274
Sully	GA	1	End B4	6.15	1.10	7.40	279	274
Sully	GA	1	60 Post	6.86	1.17	7.75	282	279
Sully	GA	1	1d Post	6.52	1.07	11.30	281	270
Sully	GA	1	2d Post	6.32	1.02	9.90	272	268

Horse	Diet	Period	Time	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg	m. osm-mOsm/kg
Sully	GA	1	3d Post	6.56	1.05	4.45	272	268
Sully	GM	2	Start B1	6.86	1.22	8.05	281	269
Sully	GM	2	End B1	5.91	1.12	8.20	283	272
Sully	GM	2	Start B2	6.46	1.11	12.00	284	276
Sully	GM	2	End B2	6.01	0.98	18.65	292	275
Sully	GM	2	Start B3	6.71	1.11	8.65	287	285
Sully	GM	2	End B3	6.30	1.13	12.75	288	275
Sully	GM	2	Start B4	6.85	1.15	23.70	296	276
Sully	GM	2	End B4	5.48	1.02	3.50	280	275
Sully	GM	2	60 Post	6.42	1.20	10.60	288	273
Sully	GM	2	1d Post					267
Sully	GM	2	2d Post	6.50	1.13	13.95	280	266
Sully	GM	2	3d Post	6.36	1.14	9.00	276	0
Sully	G	3	Start B1	6.04	1.18	8.85	286	274
Sully	G	3	End B1	6.26	1.20	11.65	284	272
Sully	G	3	Start B2	6.64	1.26	10.55	282	273
Sully	G	3	End B2	5.80	1.14	10.15	284	273
Sully	G	3	Start B3	6.22	1.17	10.30	286	274
Sully	G	3	End B3	5.91	1.09	8.85	285	275
Sully	G	3	Start B4	6.03	1.10	8.90	284	271
Sully	G	3	End B4	5.67	1.06	8.95	284	270
Sully	G	3	60 Post	6.34	1.17	9.15	288	275
Sully	G	3	1d Post	6.20	1.20	7.55	278	266
Sully	G	3	2d Post	6.24	1.17	7.20	278	266
Sully	G	3	3d Post	6.38	1.18	8.15	284	275
Vivo	G	1	Start B1	7.16	1.11	11.25	279	273
Vivo	G	1	End B1	6.55	1.04	9.05	281	274
Vivo	G	1	Start B2	6.55	1.00	9.30	281	272
Vivo	G	1	End B2	6.43	0.97	9.05	280	273
Vivo	G	1	Start B3	6.51	1.03	8.75	282	276
Vivo	G	1	End B3	6.42	1.03	7.55	281	275
Vivo	G	1	Start B4	6.77	1.12	11.20	281	277
Vivo	G	1	End B4	6.38	0.99	9.95	282	273
Vivo	G	1	60 Post	6.95	1.08	10.60	284	278
Vivo	G	1	1d Post	6.55	0.89	7.20	272	273
Vivo	G	1	2d Post	6.56	1.08	5.45	278	279
Vivo	G	1	3d Post					
Vivo	GA	2	Start B1	6.45	1.08	10.95	286	275
Vivo	GA	2	End B1	6.40	1.02	11.20	286	276
Vivo	GA	2	Start B2	6.71	1.10	11.00	285	272
Vivo	GA	2	End B2	6.16	0.98	10.95	287	280
Vivo	GA	2	Start B3	6.63	1.12	11.00	289	282
Vivo	GA	2	End B3	6.34	1.03	8.70	286	278
Vivo	GA	2	Start B4	6.65	1.09	7.85	281	275
Vivo	GA	2	End B4	6.15	1.00	9.85	283	273
Vivo	GA	2	60 Post	6.53	0.98	11.70	288	277
Vivo	GA	2	1d Post	6.57	0.96	7.95	279	267
Vivo	GA	2	2d Post	6.46	1.17	8.80	280	

Horse	Diet	Period	Time	nCa-mg/dL	nMg-mg/dL	An gap-mmol/L	osmolality-mOsm/kg	m. osm-mOsm/kg
Vivo	GA	2	3d Post	6.08	0.92	8.40	278	
Vivo	GM	3	Start B1	6.61	1.27	8.60	282	279
Vivo	GM	3	End B1	6.38	1.27	11.65	284	276
Vivo	GM	3	Start B2	6.68	1.30	13.05	285	275
Vivo	GM	3	End B2	6.38	1.24	8.20	285	277
Vivo	GM	3	Start B3	6.69	1.26	10.00	289	284
Vivo	GM	3	End B3	6.41	1.25	9.55	286	279
Vivo	GM	3	Start B4	6.64	1.20	7.85	283	280
Vivo	GM	3	End B4	6.38	1.24	7.70	284	276
Vivo	GM	3	60 Post	6.72	1.20	8.20	287	276
Vivo	GM	3	1d Post	6.53	1.16	6.20	278	274
Vivo	GM	3	2d Post	6.59	1.17	7.45	280	272
Vivo	GM	3	3d Post	6.62	1.14	7.40	279	267

Horse	Diet	Period	Time	HR-bpm	Temp-°F
Amici	C	2	start 1	48.4	36.9
Amici	C	2	B1 trot 5	108	37.1
Amici	C	2	B1 canter 4	140.7	37.8
Amici	C	2	stop 1	67.98	36.7
Amici	C	2	start 2	51.06	36.5
Amici	C	2	B2 trot 5	105.96	36.9
Amici	C	2	B2 canter 4	143.4	37.6
Amici	C	2	stop 2	84	37.2
Amici	C	2	start 3	45.18	36.7
Amici	C	2	B3 trot 5	108	37.1
Amici	C	2	B3 canter 4	141	37.6
Amici	C	2	stop 3	52.8	37.1
Amici	C	2	start 4	46.6	36.8
Amici	C	2	B4 trot 5	101.6	37.1
Amici	C	2	B4 canter 4	145.8	37.9
Amici	C	2	stop 4	71.04	36.9
Amici	A	3	start 1	42.3	36.6
Amici	A	3	B1 trot 5	109.5	37.5
Amici	A	3	B1 canter 4	147	38.2
Amici	A	3	stop 1	90	37.2
Amici	A	3	start 2	46.8	36.8
Amici	A	3	B2 trot 5	109.7	37.2
Amici	A	3	B2 canter 4	140.7	37.9
Amici	A	3	stop 2	78	37
Amici	A	3	start 3	54.4	36.7
Amici	A	3	B3 trot 5	109.7	37.3
Amici	A	3	B3 canter 4	143.4	40
Amici	A	3	stop 3	88.1	36.9
Amici	A	3	start 4		
Amici	A	3	B4 trot 5		
Amici	A	3	B4 canter 4		
Amici	A	3	stop 4		
Avanti	B	2	start 1	46.9	36.8
Avanti	B	2	B1 trot 5	113.5	36.8
Avanti	B	2	B1 canter 4	143.4	37.5
Avanti	B	2	stop 1	87.33	36.9
Avanti	B	2	start 2	59.47	36.8
Avanti	B	2	B2 trot 5	108.46	36.9
Avanti	B	2	B2 canter 4	144.6	37.6
Avanti	B	2	stop 2	77.05	37
Avanti	B	2	start 3	59.74	36.8
Avanti	B	2	B3 trot 5	112.15	36.8
Avanti	B	2	B3 canter 4	150	37.7
Avanti	B	2	stop 3	85.05	36.9
Avanti	B	2	start 4	53.7	
Avanti	B	2	B4 trot 5	105.4	
Avanti	B	2	B4 canter 4	143.5	

Horse	Diet	Period	Time	HR-bpm	Temp-°F
Avanti	B	2	stop 4		
Avanti	C	3	start 1	48.8	37.3
Avanti	C	3	B1 trot 5	127.7	37.3
Avanti	C	3	B1 canter 4	160.2	37.9
Avanti	C	3	stop 1	60.6	37.8
Avanti	C	3	start 2	54.2	36.8
Avanti	C	3	B2 trot 5	126.8	37.1
Avanti	C	3	B2 canter 4	134.3	37.4
Avanti	C	3	stop 2	77.1	37
Avanti	C	3	start 3	44.5	36.7
Avanti	C	3	B3 trot 5	112.6	37
Avanti	C	3	B3 canter 4	145.2	37
Avanti	C	3	stop 3	84	37
Avanti	C	3	start 4	49.5	
Avanti	C	3	B4 trot 5	123.5	37
Avanti	C	3	B4 canter 4	140.6	37
Avanti	C	3	stop 4	90.3	36.8
Avanti	A	4	start 1	63.9	36.6
Avanti	A	4	B1 trot 5	121.5	37.1
Avanti	A	4	B1 canter 4	151.8	37.7
Avanti	A	4	stop 1	88.3	36.9
Avanti	A	4	start 2	48	36.9
Avanti	A	4	B2 trot 5	116.1	37.2
Avanti	A	4	B2 canter 4	147	37.8
Avanti	A	4	stop 2	87.9	36.9
Avanti	A	4	start 3	54	38.4
Avanti	A	4	B3 trot 5	97.7	39.2
Avanti	A	4	B3 canter 4		40.5
Avanti	A	4	stop 3		39.2
Avanti	A	4	start 4	55.5	38.1
Avanti	A	4	B4 trot 5		39.5
Avanti	A	4	stop 4		39
Avanti	A	4	B4 canter 5		40.7
RePlay	C	2	start 1	42.5	
RePlay	C	2	B1 trot 5	108	
RePlay	C	2	B1 canter 4	144	
RePlay	C	2	stop 1		37
RePlay	C	2	start 2	56.7	37.1
RePlay	C	2	B2 trot 5	107.1	37.5
RePlay	C	2	B2 canter 4	140.7	38.1
RePlay	C	2	stop 2	87	37.4
RePlay	C	2	start 3	45.6	37.03
RePlay	C	2	B3 trot 5	111.2	37.5
RePlay	C	2	B3 canter 4	142.9	38
RePlay	C	2	stop 3	68.4	37.1
RePlay	C	2	start 4	50.35	37.02
RePlay	C	2	B4 trot 5	107	37.4
RePlay	C	2	B4 canter 4	138	37.9

Horse	Diet	Period	Time	HR-bpm	Temp-°F
RePlay	C	2	stop 4	76.4	37.05
RePlay	A	3	start 1	37.5	36.6
RePlay	A	3	B1 trot 5	118.9	37.5
RePlay	A	3	B1 canter 4	161.3	38.2
RePlay	A	3	stop 1	90.8	37.5
RePlay	A	3	start 2	47.8	36.7
RePlay	A	3	B2 trot 5	114	37.4
RePlay	A	3	B2 canter 4	157.2	37.9
RePlay	A	3	stop 2	80.4	37.4
RePlay	A	3	start 3	45.4	36.7
RePlay	A	3	B3 trot 5	112.6	37.2
RePlay	A	3	B3 canter 4	148.8	37.8
RePlay	A	3	stop 3	90.8	37.2
RePlay	A	3	start 4	48.5	37.2
RePlay	A	3	B4 trot 5	108	37.6
RePlay	A	3	stop 4	91.6	37.6
RePlay	A	3	B4 canter 6	145.6	37.9
RePlay	B	4	start 1	49.5	36.9
RePlay	B	4	B1 trot 5	115.8	37.4
RePlay	B	4	B1 canter 4	150	38
RePlay	B	4	stop 1	97.8	39.2
RePlay	B	4	start 2	49.2	39.1
RePlay	B	4	B2 trot 5	120	39.7
RePlay	B	4	B2 canter 4	157.2	41
RePlay	B	4	stop 2	84.9	40
RePlay	B	4	start 3	39.6	39.2
RePlay	B	4	B3 canter 4		41.1
RePlay	B	4	stop 3	81.5	40.5
RePlay	B	4	start 4	51.4	39.2
RePlay	B	4	B4 canter 4		41.4
RePlay	B	4	stop 4	83.6	40.5
Showtime	A	2	start 1	47.03	36.1
Showtime	A	2	B1 trot 5	102.4	36.7
Showtime	A	2	B1 canter 4	142.8	37.5
Showtime	A	2	stop 1	75.9	36.9
Showtime	A	2	start 2	54.2	36.7
Showtime	A	2	B2 trot 5	111.4	36.99
Showtime	A	2	B2 canter 4	142.2	37.42
Showtime	A	2	stop 2	78.8	37.2
Showtime	A	2	start 3	47.6	36.5
Showtime	A	2	B3 trot 5	112.2	36.85
Showtime	A	2	B3 canter 4	147	37.47
Showtime	A	2	stop 3	78.2	37.2
Showtime	A	2	start 4	42.5	36.7
Showtime	A	2	B4 trot 5	122.3	36.9
Showtime	A	2	stop 4	79.26	37.3
Showtime	A	2	B4 canter 7	139.8	37.4
Showtime	B	3	start 1	60	36.3

Horse	Diet	Period	Time	HR-bpm	Temp-°F
Showtime	B	3	B1 trot 5	114.9	36.8
Showtime	B	3	B1 canter 4	140.4	37.5
Showtime	B	3	stop 1	71.2	37
Showtime	B	3	start 2	47.4	36.6
Showtime	B	3	B2 trot 5	114	36.7
Showtime	B	3	B2 canter 4	140.4	37.4
Showtime	B	3	stop 2	78	36.9
Showtime	B	3	start 3	59.3	36.6
Showtime	B	3	B3 trot 5	109.2	37
Showtime	B	3	B3 canter 4	144	37.5
Showtime	B	3	stop 3	78.5	37.4
Showtime	B	3	start 4	42.2	36.7
Showtime	B	3	B4 trot 5	104.8	37.2
Showtime	B	3	B4 canter 4		37.5
Showtime	B	3	stop 4	72	36.9
Showtime	C	4	start 1	43.7	36.5
Showtime	C	4	B1 trot 5	112.2	37.2
Showtime	C	4	B1 canter 4	145.8	37.8
Showtime	C	4	stop 1	77	37.2
Showtime	C	4	start 2	51.5	36.9
Showtime	C	4	B2 trot 5	121	37.1
Showtime	C	4	B2 canter 4	153	37.9
Showtime	C	4	stop 2	77.2	37.5
Showtime	C	4	start 3	52.4	36.9
Showtime	C	4	B3 trot 5	126	37.3
Showtime	C	4	B3 canter 4		37.8
Showtime	C	4	stop 3	69.1	37.2
Showtime	C	4	start 4	50.4	36.5
Showtime	C	4	B4 trot 5		37.1
Showtime	C	4	B4 canter 4		37.8
Showtime	C	4	stop 4	97.8	37.5
Sully	B	2	start 1	49.8	37
Sully	B	2	B1 trot 5	104.5	37.02
Sully	B	2	B1 canter 4	139.8	37.8
Sully	B	2	stop 1	94.3	37.35
Sully	B	2	start 2	54	36.3
Sully	B	2	B2 trot 5	106.6	37.05
Sully	B	2	B2 canter 4	141	37.93
Sully	B	2	stop 2	85.4	36.79
Sully	B	2	start 3	47.6	36.8
Sully	B	2	B3 trot 5	101.1	37.4
Sully	B	2	B3 canter 4	142.3	37.9
Sully	B	2	stop 3	59.7	36.8
Sully	B	2	start 4	52.7	36.9
Sully	B	2	B4 trot 5	105.8	37.1
Sully	B	2	B4 canter 4	147.2	37.8
Sully	B	2	stop 4	79.5	37
Sully	C	3	start 1		36.8

Horse	Diet	Period	Time	HR-bpm	Temp-°F
Sully	C	3	B1 trot 5	109.7	37.5
Sully	C	3	B1 canter 4	147	37.9
Sully	C	3	stop 1	58.8	36.9
Sully	C	3	start 2	52.2	36.9
Sully	C	3	B2 trot 5	114	37.8
Sully	C	3	B2 canter 4	145.8	38.1
Sully	C	3	stop 2	66	36.9
Sully	C	3	start 3	47.6	36.9
Sully	C	3	B3 trot 5	112.1	37.3
Sully	C	3	B3 canter 4	149.4	38.1
Sully	C	3	stop 3	98.4	37.3
Sully	C	3	start 4	49.2	36.8
Sully	C	3	B4 trot 5	109.7	37.8
Sully	C	3	B4 canter 4	138.6	38
Sully	C	3	stop 4	79.6	36.9
Sully	A	4	start 1	39	39.8
Sully	A	4	B1 trot 5	114	42.9
Sully	A	4	B1 canter 4	164.6	44.1
Sully	A	4	stop 1	90	40.6
Sully	A	4	start 2	49.2	40.3
Sully	A	4	B2 trot 5	108	40.8
Sully	A	4	B2 canter 4	154.8	41.1
Sully	A	4	stop 2	86.4	40.8
Sully	A	4	start 3	39.9	39.2
Sully	A	4	B3 trot 5	106.8	39.9
Sully	A	4	B3 canter 4	147	41
Sully	A	4	stop 3	84	40.1
Sully	A	4	start 4	51	39.5
Sully	A	4	B4 trot 5	111	40.4
Sully	A	4	stop 4	92.8	39.7
Sully	A	4	B4 canter 8	145.2	41.6
Vivo	A	2	start 1	41.5	36.3
Vivo	A	2	B1 trot 5	105.4	36.8
Vivo	A	2	B1 canter 4	136.8	37.3
Vivo	A	2	stop 1	92.25	36.7
Vivo	A	2	start 2	47	36.5
Vivo	A	2	B2 trot 5	104.1	36.8
Vivo	A	2	B2 canter 4	137	37.4
Vivo	A	2	stop 2	85	36.3
Vivo	A	2	start 3	52	36.4
Vivo	A	2	B3 trot 5	97.9	36.9
Vivo	A	2	B3 canter 4	138.6	37.4
Vivo	A	2	stop 3	94.2	36.9
Vivo	A	2	start 4	46.5	36.4
Vivo	A	2	B4 trot 5	103.2	37
Vivo	A	2	stop 4	79.8	36.6
Vivo	A	2	B4 canter 9	138.6	37.5
Vivo	B	3	start 1	47.6	36.4

Horse	Diet	Period	Time	HR-bpm	Temp-°F
Vivo	B	3	B1 trot 5	102	36.4
Vivo	B	3	B1 canter 4	147	37
Vivo	B	3	stop 1	83.25	36.8
Vivo	B	3	start 2	45.8	36.4
Vivo	B	3	B2 trot 5	100.5	36.6
Vivo	B	3	B2 canter 4	150	37.2
Vivo	B	3	stop 2	78	36.5
Vivo	B	3	start 3	51	36.6
Vivo	B	3	B3 trot 5	103.9	36.7
Vivo	B	3	B3 canter 4	125.9	37.2
Vivo	B	3	stop 3	57	36.7
Vivo	B	3	start 4	48.6	36.5
Vivo	B	3	B4 trot 5	100.5	37
Vivo	B	3	B4 canter 4	118.2	37.4
Vivo	B	3	stop 4	75	37
Vivo	C	4	start 1	51.9	36.5
Vivo	C	4	B1 trot 5	109.7	36.9
Vivo	C	4	B1 canter 4	144	37.3
Vivo	C	4	stop 1	85.1	36.6
Vivo	C	4	start 2	60.3	36.5
Vivo	C	4	B2 trot 5	105.96	36.9
Vivo	C	4	B2 canter 4	147	37.4
Vivo	C	4	stop 2	86.6	36.7
Vivo	C	4	start 3	67.5	36.7
Vivo	C	4	B3 trot 5	111.9	36.9
Vivo	C	4	B3 canter 4	136.8	37.4
Vivo	C	4	stop 3	90	37
Vivo	C	4	start 4	65.4	36.8
Vivo	C	4	B4 trot 5	111.6	37
Vivo	C	4	B4 canter 4		37.5
Vivo	C	4	stop 4	93.27	36.9

Horse	Diet	Period	Time	Insulin-µIU/ml
Amici	A	3	Pre	0.92
Amici	A	3	Start B1	1.53
Amici	A	3	Start B3	4.75
Amici	A	3	60 min Post	6.37
Amici	A	3	1D Post	1.78
Amici	B	4	Pre	1.33
Amici	B	4	Start B1	1.17
Amici	B	4	Start B3	
Amici	B	4	60 min Post	
Amici	B	4	1D Post	
Amici	C	2	Pre	1.89
Amici	C	2	Start B1	6.82
Amici	C	2	Start B3	6.28
Amici	C	2	60 min Post	3.85
Amici	C	2	1D Post	1.35
Avanti	A	4	Pre	1.95
Avanti	A	4	Start B1	16.29
Avanti	A	4	Start B3	11.92
Avanti	A	4	60 min Post	6.34
Avanti	A	4	1D Post	15.97
Avanti	B	2	Pre	1.00
Avanti	B	2	Start B1	9.62
Avanti	B	2	Start B3	10.25
Avanti	B	2	60 min Post	7.69
Avanti	B	2	1D Post	2.56
Avanti	C	3	Pre	2.55
Avanti	C	3	Start B1	26.49
Avanti	C	3	Start B3	8.58
Avanti	C	3	60 min Post	1.61
Avanti	C	3	1D Post	3.24
RePlay	A	3	Pre	1.36
RePlay	A	3	Start B1	4.68
RePlay	A	3	Start B3	7.10
RePlay	A	3	60 min Post	5.00
RePlay	A	3	1D Post	1.45
RePlay	B	4	Pre	1.24
RePlay	B	4	Start B1	7.63
RePlay	B	4	Start B3	7.91
RePlay	B	4	60 min Post	5.52
RePlay	B	4	1D Post	1.43
RePlay	C	2	Pre	0.96
RePlay	C	2	Start B1	2.99
RePlay	C	2	Start B3	7.37
RePlay	C	2	60 min Post	3.10
RePlay	C	2	1D Post	0.83
Showtime	A	2	Pre	11.88
Showtime	A	2	Start B1	7.28

Horse	Diet	Period	Time	Insulin-µIU/ml
Showtime	A	2	Start B3	14.77
Showtime	A	2	60 min Post	16.93
Showtime	A	2	1D Post	7.41
Showtime	B	3	Pre	4.87
Showtime	B	3	Start B1	20.15
Showtime	B	3	Start B3	8.81
Showtime	B	3	60 min Post	11.82
Showtime	B	3	1D Post	4.77
Showtime	C	4	Pre	3.19
Showtime	C	4	Start B1	11.43
Showtime	C	4	Start B3	7.69
Showtime	C	4	60 min Post	7.84
Showtime	C	4	1D Post	5.28
Sully	A	4	Pre	1.27
Sully	A	4	Start B1	2.72
Sully	A	4	Start B3	4.35
Sully	A	4	60 min Post	3.21
Sully	A	4	1D Post	1.52
Sully	B	2	Pre	2.06
Sully	B	2	Start B1	5.96
Sully	B	2	Start B3	5.49
Sully	B	2	60 min Post	2.84
Sully	B	2	1D Post	1.95
Sully	C	3	Pre	2.80
Sully	C	3	Start B1	4.66
Sully	C	3	Start B3	5.26
Sully	C	3	60 min Post	4.76
Sully	C	3	1D Post	1.89
Vivo	A	2	Pre	3.03
Vivo	A	2	Start B1	6.64
Vivo	A	2	Start B3	6.15
Vivo	A	2	60 min Post	3.10
Vivo	A	2	1D Post	1.09
Vivo	B	3	Pre	0.88
Vivo	B	3	Start B1	5.04
Vivo	B	3	Start B3	10.18
Vivo	B	3	60 min Post	6.51
Vivo	B	3	1D Post	1.58
Vivo	C	4	Pre	2.35
Vivo	C	4	Start B1	9.39
Vivo	C	4	Start B3	12.50
Vivo	C	4	60 min Post	2.73
Vivo	C	4	1D Post	2.19

Horse	Diet	Period	Time	Cortisol-µg/dl
Amici	A	3	Start B1	1.61
Amici	A	3	End B2	3.98
Amici	A	3	Start B3	2.87
Amici	A	3	End B4	
Amici	A	3	60 Min Post	0.75
Amici	B	4	Start B1	1.47
Amici	B	4	End B2	
Amici	B	4	Start B3	
Amici	B	4	End B4	
Amici	B	4	60 Min Post	
Amici	C	2	Start B1	1.55
Amici	C	2	End B2	3.17
Amici	C	2	Start B3	1.94
Amici	C	2	End B4	3.59
Amici	C	2	60 Min Post	1.12
Avanti	A	4	Start B1	2.85
Avanti	A	4	End B2	3.39
Avanti	A	4	Start B3	2.00
Avanti	A	4	End B4	2.62
Avanti	A	4	60 Min Post	0.85
Avanti	B	2	Start B1	1.76
Avanti	B	2	End B2	3.58
Avanti	B	2	Start B3	2.37
Avanti	B	2	End B4	3.52
Avanti	B	2	60 Min Post	0.79
Avanti	C	3	Start B1	3.28
Avanti	C	3	End B2	3.89
Avanti	C	3	Start B3	3.05
Avanti	C	3	End B4	3.76
Avanti	C	3	60 Min Post	0.41
RePlay	A	3	Start B1	3.25
RePlay	A	3	End B2	5.85
RePlay	A	3	Start B3	2.83
RePlay	A	3	End B4	4.35
RePlay	A	3	60 Min Post	0.66
RePlay	B	4	Start B1	2.43
RePlay	B	4	End B2	5.53
RePlay	B	4	Start B3	3.26
RePlay	B	4	End B4	4.79
RePlay	B	4	60 Min Post	0.42
RePlay	C	2	Start B1	2.47
RePlay	C	2	End B2	4.54
RePlay	C	2	Start B3	2.87
RePlay	C	2	End B4	2.93
RePlay	C	2	60 Min Post	0.61
Showtime	A	2	Start B1	2.42
Showtime	A	2	End B2	4.07

Horse	Diet	Period	Time	Cortisol-µg/dl
Showtime	A	2	Start B3	2.18
Showtime	A	2	End B4	2.19
Showtime	A	2	60 Min Post	2.07
Showtime	B	3	Start B1	2.84
Showtime	B	3	End B2	6.91
Showtime	B	3	Start B3	2.93
Showtime	B	3	End B4	3.58
Showtime	B	3	60 Min Post	0.77
Showtime	C	4	Start B1	1.43
Showtime	C	4	End B2	3.26
Showtime	C	4	Start B3	4.05
Showtime	C	4	End B4	5.02
Showtime	C	4	60 Min Post	1.06
Sully	A	4	Start B1	4.01
Sully	A	4	End B2	5.24
Sully	A	4	Start B3	4.24
Sully	A	4	End B4	4.10
Sully	A	4	60 Min Post	1.35
Sully	B	2	Start B1	2.77
Sully	B	2	End B2	3.16
Sully	B	2	Start B3	1.89
Sully	B	2	End B4	3.41
Sully	B	2	60 Min Post	1.10
Sully	C	3	Start B1	2.42
Sully	C	3	End B2	3.72
Sully	C	3	Start B3	2.04
Sully	C	3	End B4	3.50
Sully	C	3	60 Min Post	1.02
Vivo	A	2	Start B1	2.21
Vivo	A	2	End B2	3.85
Vivo	A	2	Start B3	2.45
Vivo	A	2	End B4	4.02
Vivo	A	2	60 Min Post	1.12
Vivo	B	3	Start B1	4.38
Vivo	B	3	End B2	4.81
Vivo	B	3	Start B3	2.51
Vivo	B	3	End B4	3.51
Vivo	B	3	60 Min Post	1.04
Vivo	C	4	Start B1	4.31
Vivo	C	4	End B2	3.68
Vivo	C	4	Start B3	1.93
Vivo	C	4	End B4	2.89
Vivo	C	4	60 Min Post	0.50

Horse	Period	Diet	Time	Nefa-mEq/l	TG-mg/dl
Amici	1	G	1 Day Post	0.923	19.136
Amici	1	G	End B2	0.979	28.281
Amici	1	G	End B4	1.328	42.986
Amici	1	G	Start B1	0.566	39.3805
Amici	1	G	Start B3	0.77	30.348
Amici	2	C	1 Day Post	0.004	18.1
Amici	2	C	End B2	0.876	23.756
Amici	2	C	End B4	0.995	20.362
Amici	2	C	Start B1	0.236	37.811
Amici	2	C	Start B3	0.377	45.249
Amici	3	A	1 Day Post	0.5	32.1425
Amici	3	A	End B2	0.885	27.149
Amici	3	A	Start B1	0.609	41.542
Amici	3	A	Start B3	0.649	31.674
Amici	4	B	Start B1	0.222	86.7675
Avanti	1	G	1 Day Post	0.339	32.836
Avanti	1	G	End B2	1.014	32.805
Avanti	1	G	End B4	1.333	86.318
Avanti	1	G	Start B1	0.9275	41.6425
Avanti	1	G	Start B3	1.07	31.674
Avanti	2	B	1 Day Post	0.623	39.3805
Avanti	2	B	End B2	1.288	40.5115
Avanti	2	B	End B4	1.3	53.167
Avanti	2	B	Start B1	0.545	48.643
Avanti	2	B	Start B3	0.698	95.023
Avanti	3	C	1 Day Post	0.848	21.642
Avanti	3	C	End B2	0.517	39.593
Avanti	3	C	End B4	1.426	21.642
Avanti	3	C	Start B1	0.256	51.493
Avanti	3	C	Start B3	0.665	47.761
Avanti	4	A	1 Day Post	0.351	26.617
Avanti	4	A	End B2	0.937	34.08
Avanti	4	A	End B4	1.166	41.855
Avanti	4	A	Start B1	0.381	78.5115
Avanti	4	A	Start B3	0.592	36.567
Replay	1	G	1 Day Post	0.283	39.981
Replay	1	G	End B2	0.82	19.553
Replay	1	G	End B4	1.378	53.113
Replay	1	G	Start B1	0.809	31.226
Replay	1	G	Start B3	0.462	47.3935
Replay	2	C	1 Day Post	0.471	23.93
Replay	2	C	End B2	1.02	27.149
Replay	2	C	End B4	1.292	35.603
Replay	2	C	Start B1	0.817	34.144
Replay	2	C	Start B3	0.417	63.348
Replay	3	A	1 Day Post	0.5065	61.868
Replay	3	A	End B2	0.995	79.377

Horse	Period	Diet	Time	Nefa-mEq/l	TG-mg/dl
Replay	3	A	End B4	1.351	75
Replay	3	A	Start B1	0.362	85.214
Replay	3	A	Start B3	0.388	42.899
Replay	4	B	1 Day Post	0.329	38.521
Replay	4	B	End B2	0.551	59.155
Replay	4	B	End B4	1.36	43.31
Replay	4	B	Start B1	0.111	51.374
Replay	4	B	Start B3	0.293	68.398
Showtime	1	G	1 Day Post	0.332	29.135
Showtime	1	G	End B2	0.8605	24.6125
Showtime	1	G	End B4	1.1395	42.792
Showtime	1	G	Start B1	0.77	8.979
Showtime	1	G	Start B3	0.632	34.825
Showtime	2	A	1 Day Post	0.464	46.206
Showtime	2	A	End B2	0.977	64.416
Showtime	2	A	End B4	0.9485	45.068
Showtime	2	A	Start B1	0.531	53.035
Showtime	2	A	Start B3	0.83	19.542
Showtime	3	B	1 Day Post	0.379	32.549
Showtime	3	B	End B2	0.772	42.792
Showtime	3	B	End B4	1.059	26.144
Showtime	3	B	Start B1	0.357	50.759
Showtime	3	B	Start B3	0.767	19.542
Showtime	4	C	1 Day Post	0.225	28.785
Showtime	4	C	End B2	0.488	29.135
Showtime	4	C	End B4	0.731	34.825
Showtime	4	C	Start B1	0.281	34.446
Showtime	4	C	Start B3	0.386	31.426
Sully	1	G	1 Day Post	0.435	38.439
Sully	1	G	End B2	0.723	38.24
Sully	1	G	End B4	1.343	46.206
Sully	1	G	Start B1	0.845	88.316
Sully	1	G	Start B3	0.975	25.403
Sully	2	B	1 Day Post	0.281	41.654
Sully	2	B	End B2	1.128	86.039
Sully	2	B	End B4	0.385	70.106
Sully	2	B	Start B1	1.266	54.173
Sully	2	B	Start B3	0.433	54.173
Sully	3	C	1 Day Post	0.192	23.2145
Sully	3	C	End B2	0.598	12.097
Sully	3	C	End B4	1.0475	27.997
Sully	3	C	Start B1	0.118	46.6915
Sully	3	C	Start B3	0.209	42.792
Sully	4	A	1 Day Post	0.321	29.048
Sully	4	A	End B2	0.749	72.517
Sully	4	A	End B4	1.251	58.725
Sully	4	A	Start B1	0.176	65.4025
Sully	4	A	Start B3	0.281	45.968

Horse	Period	Diet	Time	Nefa-mEq/l	TG-mg/dl
Vivo	1	G	1 Day Post	0.206	34.144
Vivo	1	G	End B2	1.351	25.403
Vivo	1	G	End B4	1.518	32.661
Vivo	1	G	Start B1	1.016	32.685
Vivo	1	G	Start B3	0.762	42.339
Vivo	2	A	1 Day Post	0.351	19.553
Vivo	2	A	End B2	1.135	67.704
Vivo	2	A	End B4	0.945	53.113
Vivo	2	A	Start B1	0.63	48.634
Vivo	2	A	Start B3	0.406	74.503
Vivo	3	B	1 Day Post	0.487	38.792
Vivo	3	B	End B2	1.28	37.062
Vivo	3	B	End B4	1.124	29.767
Vivo	3	B	Start B1	0.249	31.226
Vivo	3	B	Start B3	0.7	45.817
Vivo	4	C	1 Day Post	0.348	17.498
Vivo	4	C	End B2	1.092	21.012
Vivo	4	C	End B4	1.369	7.879
Vivo	4	C	Start B1	0.145	71.916
Vivo	4	C	Start B3	0.265	31.226

Horse	Diet	Period	Time	Aldosterone-pg/ml
Amici	G	2	Start B1	4.63
Amici	G	2	1 D Post	6.67
Amici	GA	3	Start B1	31.37
Amici	GM	1	Start B1	40.18
Amici	GM	1	End B4	108.79
Amici	GM	1	1 D Post	6.19
Avanti	G	3	Start B1	15.83
Avanti	G	3	End B4	36.41
Avanti	G	3	1 D Post	29.16
Avanti	GA	1	Start B1	15.56
Avanti	GA	1	End B4	104.57
Avanti	GA	1	1 D Post	30.90
Avanti	GM	2	Start B1	44.17
Avanti	GM	2	End B4	53.15
Avanti	GM	2	1 D Post	0.50
RePlay	G	2	Start B1	39.40
RePlay	G	2	End B4	65.26
RePlay	G	2	1 D Post	5.75
RePlay	GA	3	Start B1	26.18
RePlay	GA	3	End B4	81.48
RePlay	GA	3	1 D Post	10.02
RePlay	GM	1	Start B1	35.91
RePlay	GM	1	End B4	10.61
RePlay	GM	1	1 D Post	0.63
Showtime	G	1	Start B1	34.88
Showtime	G	1	End B4	124.68
Showtime	G	1	1 D Post	42.11
Showtime	GA	2	Start B1	45.86
Showtime	GA	2	End B4	109.07
Showtime	GA	2	1 D Post	11.25
Showtime	GM	3	Start B1	16.64
Showtime	GM	3	End B4	71.23
Showtime	GM	3	1 D Post	14.29
Sully	G	3	Start B1	61.30
Sully	G	3	End B4	47.87
Sully	G	3	1 D Post	11.92
Sully	GA	1	Start B1	65.31
Sully	GA	1	End B4	118.50
Sully	GA	1	1 D Post	20.47
Sully	GM	2	Start B1	45.79
Sully	GM	2	End B4	38.94
Sully	GM	2	1 D Post	12.62
Vivo	G	1	Start B1	33.65
Vivo	G	1	End B4	16.24
Vivo	G	1	1 D Post	143.47
Vivo	GA	2	Start B1	46.76
Vivo	GA	2	End B4	90.84

Horse	Diet	Period	Time	Aldosterone-pg/ml
Vivo	GA	2	1 D Post	41.40
Vivo	GM	3	Start B1	116.26
Vivo	GM	3	End B4	89.10
Vivo	GM	3	1 D Post	17.65

APPENDIX B

Raw Data- Project Year 2

Horse	Fiber	Fat	Diet	Period	Intake (kg/d)	BM (kg)	TBW (kg)	TBW as %BM	Intake as %BM
Goliath	M	N	C	1	6.63	408.0	262.6	64.36%	1.63%
Goliath	G	N	A	2	5.83	393.0	257.1	65.42%	1.48%
Goliath	M	Y	D	3	7.79	397.0	261.8	65.94%	1.96%
Goliath	G	Y	B	4	7.06	389.0	262	67.35%	1.82%
Sassy	G	N	A	1	5.50	348.5	230.5	66.14%	1.58%
Sassy	M	Y	D	2	7.78	346.0	242	69.94%	2.25%
Sassy	G	Y	B	3	6.81	341.5	234.8	68.76%	1.99%
Sassy	M	N	C	4	9.69	355.5	239.6	67.40%	2.73%
Smagic	M	Y	D	1	4.57	353.5	224.9	63.62%	1.29%
Smagic	G	Y	B	2	4.97	348.0	234.8	67.47%	1.43%
Smagic	G	N	A	3	6.15	342.5	233.2	68.09%	1.80%
Smagic	M	N	C	4	9.25	365.5	242.5	66.35%	2.53%
Starlet	G	N	A	1	5.10	358.0	227.3	63.49%	1.42%
Starlet	M	N	C	2	7.66	367.0	242.2	65.99%	2.09%
Starlet	G	Y	B	3	6.63	364.0	236.3	64.92%	1.82%
Starlet	M	Y	D	4	9.73	378.0	253.8	67.14%	2.57%
Stimpy	M	Y	D	1	4.42	351.5	228.3	64.95%	1.26%
Stimpy	G	Y	B	2	5.45	351.5	236.5	67.28%	1.55%
Stimpy	M	N	C	3	8.18	360.5	242	67.13%	2.27%
Stimpy	G	N	A	4	7.23	360.0	248.7	69.08%	2.01%
Tank	G	Y	B	1	4.84	378.0	235.9	62.41%	1.28%
Tank	M	N	C	2	7.56	386.0	228.8	59.27%	1.96%
Tank	G	N	A	3	7.05	382.5	247.4	64.68%	1.84%
Tank	M	Y	D	4	9.78	397.5	259	65.16%	2.46%

Horse	Fiber	Fat	Diet	Per.	BM-Start (kg)	BM-End (kg)	Feces (kg)	Urine (L)	Water (L)	Uncorr. Loss	Corr. Loss
Goliath	M	N	C	1	408	397.5	3	2.5	12.5	2.57%	4.29%
Goliath	G	N	A	2	393	389	4.25	0	15	1.02%	3.75%
Goliath	M	Y	D	3	397	387	2.5	0	12	2.52%	4.91%
Goliath	G	Y	B	4	389	385	4.5	0	20.5	1.03%	5.14%
Sassy	G	N	A	1	338.5	333	3.5	1	14	1.62%	4.43%
Sassy	M	Y	D	2	346	340	4.25	1	11	1.73%	3.40%
Sassy	G	Y	B	3	341.5	342	4.5	0	15.5	-0.15%	3.07%
Sassy	M	N	C	4	355.5	350	2.5	0	15	1.55%	5.06%
Smagic	M	Y	D	1	353.5	346.5	3.75	1.25	12	1.98%	3.96%
Smagic	G	Y	B	2	348	340.5	4.5	2	13	2.16%	4.02%
Smagic	G	N	A	3	342.5	337	4.5	0	11	1.61%	3.50%
Smagic	M	N	C	4	355.5	346.5	5	0	10.5	2.53%	4.08%
Starlet	G	N	A	1	358	353	2.5	2	12.5	1.40%	3.63%
Starlet	M	N	C	2	367	356	3.5	1.5	12.5	3.00%	5.04%
Starlet	G	Y	B	3	364	355.5	4	1	11	2.34%	3.98%
Starlet	M	Y	D	4	378	367	3.25	3	13.5	2.91%	4.83%
Stimpy	M	Y	D	1	351.5	346	3.5	1.25	11.5	1.56%	3.49%
Stimpy	G	Y	B	2	351.5	346.5	3	0	12.5	1.42%	4.13%
Stimpy	M	N	C	3	360.5	353.5	4	0	8.5	1.94%	3.19%
Stimpy	G	N	A	4	360	348	5	2	13	3.33%	5.00%
Tank	G	Y	B	1	378.5	368	3.25	0	7	2.77%	3.76%
Tank	M	N	C	2	386	375	4	0	6.5	2.85%	3.50%
Tank	G	N	A	3	382.5	371	3.25	0	7	3.01%	3.99%
Tank	M	Y	D	4	397.5	380.5	3.5	2.5	7.5	4.28%	4.65%

Horse	Fiber	Fat	Diet	Day	Period	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Goliath	M	N	C	0	1	30	6.8	7.40	43.3	52.45
Goliath	M	N	C	7	1	33	6.05	7.44	52.85	49.95
Goliath	M	N	C	14	1	28	6.1	7.43	49.9	56.9
Goliath	G	N	A	0	2	32.5	6.3	7.41	53.35	45.75
Goliath	G	N	A	7	2	31	6.1	7.44	49.65	40.05
Goliath	G	N	A	14	2	29	6	7.41	50.15	45.7
Goliath	M	Y	D	0	3	32	6	7.43	47.85	37.3
Goliath	M	Y	D	7	3	29	6	7.44	52.75	44
Goliath	M	Y	D	14	3	30	5.55	7.44	47.55	36.95
Goliath	G	Y	B	0	4	30	6	7.43	53.75	44
Goliath	G	Y	B	7	4	30	6	7.50	48.4	48.55
Goliath	G	Y	B	14	4	31	5.9	7.44	50.85	40.9
Sassy	G	N	A	0	1	40	6.5	7.45	46	53.2
Sassy	G	N	A	7	1	33	6	7.43	45.75	54
Sassy	G	N	A	14	1	38.25	6.15	7.43	48.65	49.95
Sassy	M	Y	D	0	2	34	5.9	7.43	45.75	48.95
Sassy	M	Y	D	7	2	33.5	5.9	7.43	50	50.85
Sassy	M	Y	D	14	2	32	6.4	7.47	47.55	42.4
Sassy	G	Y	B	0	3	41	6	7.46	51.6	40.7
Sassy	G	Y	B	7	3	35	6.05	7.41	46.35	39.2
Sassy	G	Y	B	14	3	39	6.1	7.42	49.4	38.85
Sassy	M	N	C	0	4	35.5	6	7.48	48.3	48.1
Sassy	M	N	C	7	4	33	5.5	7.44	52.2	47.5
Sassy	M	N	C	14	4	33.5	6	7.46	53.1	42.45
Smagic	M	Y	D	0	1	33	6.9	7.41	41.95	49.3
Smagic	M	Y	D	7	1	37	6.4	7.43	53.4	47.25
Smagic	M	Y	D	14	1	36	6.7	7.44	49.65	40.35
Smagic	G	Y	B	0	2	37.5	6.25	7.42	52.45	40.5
Smagic	G	Y	B	7	2	35.5	6.2	7.43	49.2	39.65
Smagic	G	Y	B	14	2	37	6.3	7.42	49.65	39.65
Smagic	G	N	A	0	3	36	6	7.43	49.1	39.5
Smagic	G	N	A	7	3	42	6.25	7.44	54.2	38.35
Smagic	G	N	A	14	3	32.5	5.9	7.41	49.85	38.3
Smagic	M	N	C	0	4	30				
Smagic	M	N	C	7	4	30	5.75	7.52	46.9	41.85
Smagic	M	N	C	14	4	32	5.6	7.44	56.55	42.35
Starlet	G	N	A	0	1	30	6.45	7.40	43.2	45
Starlet	G	N	A	7	1	34	6.9	7.42	50.75	45.45
Starlet	G	N	A	14	1	32	6.85	7.44	46.25	50.65
Starlet	M	N	C	0	2	30.5	6.1	7.42	50.15	42.7
Starlet	M	N	C	7	2	31	6.2	7.44	49.8	41.9
Starlet	M	N	C	14	2	30	6.2	7.42	53.25	43.95
Starlet	G	Y	B	0	3	30	6.8	7.44	50.65	40.65
Starlet	G	Y	B	7	3	35.5	6.75	7.42	53.9	39.1
Starlet	G	Y	B	14	3	31	6.25	7.43	47.7	37.9
Starlet	M	Y	D	0	4	28	6.4	7.41	52.1	40.1
Starlet	M	Y	D	7	4	28	6.35	7.50	49.9	42.2

Horse	Fiber	Fat	Diet	Day	Period	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Starlet	M	Y	D	14	4	30	6.4	7.42	51.4	40.25
Stimpy	M	Y	D	0	1	37	6.9	7.44	49.15	43.3
Stimpy	M	Y	D	7	1	34.5	6.7	7.47	44.7	47.7
Stimpy	M	Y	D	14	1	35.75	6.8	7.45	49.85	37.4
Stimpy	G	Y	B	0	2	32.25	6.4	7.45	48.45	40.8
Stimpy	G	Y	B	7	2	31	6.4	7.41	52.3	38.25
Stimpy	G	Y	B	14	2	34	5.9	7.43	50.05	39.4
Stimpy	M	N	C	0	3	30	6.45	7.43	52.6	36.9
Stimpy	M	N	C	7	3	34	6.25	7.44	50	37.95
Stimpy	M	N	C	14	3	31.5	6	7.43	2543	40.55
Stimpy	G	N	A	0	4	27	5.8	7.50	49.9	38.65
Stimpy	G	N	A	7	4	31	6.1	7.43	51.95	39.55
Stimpy	G	N	A	14	4	38	6.4	7.44	54.25	33.45
Tank	G	Y	B	0	1	35	6.3	7.44	51.3	48.5
Tank	G	Y	B	7	1	32	6.1	7.41	50.25	47.95
Tank	G	Y	B	14	1	32.5	5.95	7.43	45.8	45.1
Tank	M	N	C	0	2	26	6.1	7.41	51.65	37.65
Tank	M	N	C	7	2	25	6	7.41	49.8	44
Tank	M	N	C	14	2	38	6.2	7.44	52.1	39.9
Tank	G	N	A	0	3	26.5	5.65	7.44	54.1	41.5
Tank	G	N	A	7	3	31.5	5.5	7.42	49.9	40
Tank	G	N	A	14	3	31	5.7	7.40	53.15	39.3
Tank	M	Y	D	0	4	27	5.55	7.48	50.35	46.3
Tank	M	Y	D	7	4	30	5.6	7.41	53.4	44.9
Tank	M	Y	D	14	4	29.5	5.85	7.43	53.1	38.8

Horse	Fiber	Fat	Diet	Day	Period	Na (mmol/L)	K (mmol/L)	Cl (mmol/L)	Ca (mg/dl)	Mg (mg/dl)
Goliath	M	N	C	0	1	135.55	3.87	102.65	5.76	1.055
Goliath	M	N	C	7	1	136	3.7	97	6.2	0.485
Goliath	M	N	C	14	1	136.5	3.3	102.5	6.085	1.05
Goliath	G	N	A	0	2	138	3.5	55	6.525	1.195
Goliath	G	N	A	7	2	140	3.9	101.5	6.24	0.895
Goliath	G	N	A	14	2	137	3.7	100.5	5.86	0.765
Goliath	M	Y	D	0	3	137	3.6	101.5	5.67	0.7
Goliath	M	Y	D	7	3	137.5	3.6	98	6.265	1.03
Goliath	M	Y	D	14	3	138	3.2	102	5.585	0.955
Goliath	G	Y	B	0	4	138.5	3.65	100.5	6.645	1.205
Goliath	G	Y	B	7	4	137.5	3.3	103	5.45	0.805
Goliath	G	Y	B	14	4	136	3.5	100.5	6.245	1.1
Sassy	G	N	A	0	1	138	4.3	101	6.385	0.485
Sassy	G	N	A	7	1	136.5	4	106	6.06	0.95
Sassy	G	N	A	14	1	137.5	4.3	103.5	6.09	0.995
Sassy	M	Y	D	0	2	139	4.25	103.5	5.91	0.795
Sassy	M	Y	D	7	2	139.5	4	102.5	5.86	0.92
Sassy	M	Y	D	14	2	139.5	4.05	100	6.39	1.025
Sassy	G	Y	B	0	3	139	4	99.5	5.88	0.8
Sassy	G	Y	B	7	3	139.5	3.6	102.5	5.83	0.97
Sassy	G	Y	B	14	3	139	4.2	101.5	6.385	1.015
Sassy	M	N	C	0	4	137	3.8	103	5.855	0.985
Sassy	M	N	C	7	4	138	3.5	101.5	5.85	1.06
Sassy	M	N	C	14	4	135.5	3.55	99.5	6.565	0.99
Smagic	M	Y	D	0	1	136.8	3.735	103.5	5.845	1.07
Smagic	M	Y	D	7	1	136	3.8	98	6.255	0.49
Smagic	M	Y	D	14	1	140.5	3.15	100.5	5.68	0.91
Smagic	G	Y	B	0	2	139	3.7	100	6.205	1.035
Smagic	G	Y	B	7	2	140	3.7	102	6.01	0.81
Smagic	G	Y	B	14	2	140	3.7	100.5	6.245	0.885
Smagic	G	N	A	0	3	139	3.5	101	5.51	0.69
Smagic	G	N	A	7	3	139.5	3.75	97	6.475	0.975
Smagic	G	N	A	14	3	138.5	3.65	100	5.865	0.985
Smagic	M	N	C	0	4					
Smagic	M	N	C	7	4	137.5	3.5	103	5.09	0.86
Smagic	M	N	C	14	4	138	3.3	99	5.855	1.07
Starlet	G	N	A	0	1	137.2	3.855	104.9	6.03	1.185
Starlet	G	N	A	7	1	137.5	4.2	100.5	6.535	0.505
Starlet	G	N	A	14	1	140	3.7	106	6.315	1.04
Starlet	M	N	C	0	2	140	3.9	104.5	5.99	0.85
Starlet	M	N	C	7	2	140	3.9	103.5	6.33	0.995
Starlet	M	N	C	14	2	138.5	3.7	102.5	6.195	0.87
Starlet	G	Y	B	0	3	139	3.65	103.5	5.845	0.735
Starlet	G	Y	B	7	3	138.5	4.3	100.5	6.57	1.03
Starlet	G	Y	B	14	3	137.5	3.3	102	6.025	1.03
Starlet	M	Y	D	0	4	136.5	4.3	103	6.69	1.075
Starlet	M	Y	D	7	4	140	3.4	105	5.92	0.95

Horse	Fiber	Fat	Diet	Day	Period	Na (mmol/L)	K (mmol/L)	Cl (mmol/L)	Ca (mg/dl)	Mg (mg/dl)
Starlet	M	Y	D	14	4	139.5	3.65	104	6.35	1.135
Stimpy	M	Y	D	0	1	137.5	4	99	6.305	0.495
Stimpy	M	Y	D	7	1	139.5	3.6	103	6.05	0.99
Stimpy	M	Y	D	14	1	140.5	3.7	101	5.995	0.965
Stimpy	G	Y	B	0	2	138.5	3.4	102.5	5.92	0.86
Stimpy	G	Y	B	7	2	138.5	3.9	100	6.455	1.015
Stimpy	G	Y	B	14	2	139	3.6	101	6.39	1.05
Stimpy	M	N	C	0	3	139	3.65	100	6.235	0.965
Stimpy	M	N	C	7	3	139.5	3.5	101.5	4.715	1.06
Stimpy	M	N	C	14	3	139.5	3.4	102.5	6.015	1.025
Stimpy	G	N	A	0	4	137	3.2	103	5.385	0.95
Stimpy	G	N	A	7	4	138	3.3	102	6.07	1.02
Stimpy	G	N	A	14	4	137.5	3.4	100	6.3	0.975
Tank	G	Y	B	0	1	135.5	4	99	6.545	0.52
Tank	G	Y	B	7	1	137.5	3.7	101	6.125	1.06
Tank	G	Y	B	14	1	133.5	4.2	106	5.99	0.93
Tank	M	N	C	0	2	138	4.2	101.5	6.55	1.13
Tank	M	N	C	7	2	138	3.8	100.5	6.315	1.06
Tank	M	N	C	14	2	137	3.65	100.5	6.46	1.04
Tank	G	N	A	0	3	137.5	3.4	97	6.705	1.155
Tank	G	N	A	7	3	137	3.5	100	5.98	1.03
Tank	G	N	A	14	3	135.5	3.7	100	6.425	1.105
Tank	M	Y	D	0	4	135.5	3.55	103	5.72	0.99
Tank	M	Y	D	7	4	137	3.4	102	6.355	1.355
Tank	M	Y	D	14	4	136	3.55	101	6.58	1.155

Horse	Fiber	Fat	Diet	Day	Per.	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Goliath	M	N	C	0	1	103.5	0.5	19	2.05	26.8
Goliath	M	N	C	7	1		0.6	15.5	11.05	36.1
Goliath	M	N	C	14	1	109	0.45	15	9.1	33.55
Goliath	G	N	A	0	2	109	0	15.5	8.85	34.25
Goliath	G	N	A	7	2	111	0	14	9.05	33.75
Goliath	G	N	A	14	2	100.5		15.5	6.6	31.55
Goliath	M	Y	D	0	3	101	0.9	14	7.3	31.85
Goliath	M	Y	D	7	3	108.5	0.5	18	11.3	36.3
Goliath	M	Y	D	14	3		0.3	16	7.9	32.35
Goliath	G	Y	B	0	4		0.2	16.5	10.4	35.65
Goliath	G	Y	B	7	4		0.2	15	14.25	38.25
Goliath	G	Y	B	14	4		0.1	15	9.95	34.65
Sassy	G	N	A	0	1		0.6	20	8	32.45
Sassy	G	N	A	7	1	105	0.55	15.5	5.95	30.35
Sassy	G	N	A	14	1	102	0.5	17	7.4	32.2
Sassy	M	Y	D	0	2	97		18.5	5.95	30.4
Sassy	M	Y	D	7	2	99		17.5	8.2	33.15
Sassy	M	Y	D	14	2	100		18	10.35	34.8
Sassy	G	Y	B	0	3	99.5	0.3	20	11.5	36.75
Sassy	G	Y	B	7	3		1	21	4.9	29.6
Sassy	G	Y	B	14	3		0.55	21.5	7.2	32.3
Sassy	M	N	C	0	4		0.4	18	11.8	36.05
Sassy	M	N	C	7	4		0.15	18	10.2	35.25
Sassy	M	N	C	14	4		0	19.5	12.5	37.5
Smagic	M	Y	D	0	1	104	0.6	18	2.55	27
Smagic	M	Y	D	7	1		0.8	12	10.15	35.6
Smagic	M	Y	D	14	1	114	0.8	10	8.75	33.65
Smagic	G	Y	B	0	2	108	0.35	12	8.5	34
Smagic	G	Y	B	7	2	108.5	0.15	12	7.65	32.55
Smagic	G	Y	B	14	2	97	0.17	13	7.5	32.6
Smagic	G	N	A	0	3	98.5	1	13.5	7.7	32.55
Smagic	G	N	A	7	3	96.5	0.9	17.5	10.8	36.6
Smagic	G	N	A	14	3		0.8	17.5	6.35	31.5
Smagic	M	N	C	0	4					
Smagic	M	N	C	7	4		0	13	14.5	38.15
Smagic	M	N	C	14	4		0.1	14	13.25	38.75
Starlet	G	N	A	0	1	101	0.7	16	2.35	27
Starlet	G	N	A	7	1		1.25	13	8.2	33.25
Starlet	G	N	A	14	1	111.5	1	11	7.15	31.3
Starlet	M	N	C	0	2	96.5	0.6	14	7.5	32.3
Starlet	M	N	C	7	2	99.5	0	15	9.15	33.85
Starlet	M	N	C	14	2	97		15.5	9.8	34.95
Starlet	G	Y	B	0	3	96.5	0.4	15.5	9.55	34.35
Starlet	G	Y	B	7	3	101.5	0.45	19	9.65	35.05
Starlet	G	Y	B	14	3		0.45	15.5	7.65	32.05
Starlet	M	Y	D	0	4		0.6	16	7.8	33.1
Starlet	M	Y	D	7	4		0	13.5	14.9	38.95

Horse	Fiber	Fat	Diet	Day	Per.	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Starlet	M	Y	D	14	4			17.5	8.45	33.45
Stimpy	M	Y	D	0	1		0.6	15.5	8.55	33.55
Stimpy	M	Y	D	7	1	116.5	0.75	10	8.45	32.35
Stimpy	M	Y	D	14	1	104	0.85	15	9.7	34.5
Stimpy	G	Y	B	0	2	95.5	0	15.5	54.05	33.6
Stimpy	G	Y	B	7	2	100.5	0.1	16.5	8.15	33.5
Stimpy	G	Y	B	14	2	100.5	0.1	14	8.35	33.2
Stimpy	M	N	C	0	3	95.5	0.85	15	9.85	35.25
Stimpy	M	N	C	7	3		0.2	15	8.95	33.85
Stimpy	M	N	C	14	3		0.35	18	8.4	33.4
Stimpy	G	N	A	0	4		0.1	15	15.25	39.15
Stimpy	G	N	A	7	4		0.4	15.5	10.05	35.05
Stimpy	G	N	A	14	4		0	16.5	11.75	37.25
Tank	G	Y	B	0	1		0.5	16	9.7	34.8
Tank	G	Y	B	7	1	125.5	0.6	12.5	7.05	32.05
Tank	G	Y	B	14	1	110.5	0.75	14	6.45	30.8
Tank	M	N	C	0	2	121.5	1.1	11.5	8.1	33.2
Tank	M	N	C	7	2	109.5		12	6.6	31.7
Tank	M	N	C	14	2	104.5		15.5	10.85	35.85
Tank	G	N	A	0	3	114	0.5	15.5	12.1	37.15
Tank	G	N	A	7	3		0.8	16	7.55	32.4
Tank	G	N	A	14	3		0.6	16.5	8.2	33.45
Tank	M	Y	D	0	4	103	0.65	14	13	37.25
Tank	M	Y	D	7	4		0.1	14	8.5	33.7
Tank	M	Y	D	14	4		0	15	10.1	35.1

Horse	Fiber	Fat	Diet	Day	Period	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Goliath	M	N	C	0	1	5.7	1.05		
Goliath	M	N	C	7	1	6.345	0.485	6.05	
Goliath	M	N	C	14	1	6.195	1.06	4.2	275
Goliath	G	N	A	0	2	6.575	1.2	6.85	277
Goliath	G	N	A	7	2	6.37	0.905	8.6	280
Goliath	G	N	A	14	2	5.875	0.765	8.7	275
Goliath	M	Y	D	0	3	5.76	0.705	6.95	274
Goliath	M	Y	D	7	3	6.42	1.045	6.65	276.5
Goliath	M	Y	D	14	3	5.705	0.97	7.1	
Goliath	G	Y	B	0	4	6.745	1.215	5.55	
Goliath	G	Y	B	7	4	5.765	0.835		
Goliath	G	Y	B	14	4	6.38	1.12	3.95	
Sassy	G	N	A	0	1	6.575	0.495	8.45	
Sassy	G	N	A	7	1	6.155	0.96	4.2	274.5
Sassy	G	N	A	14	1	6.18	1	6.1	277
Sassy	M	Y	D	0	2	6	0.8	9.2	279.5
Sassy	M	Y	D	7	2	5.955	0.925	7.35	280
Sassy	M	Y	D	14	2	6.64	1.05	8.35	280
Sassy	G	Y	B	0	3	6.075	0.81	6.25	280
Sassy	G	Y	B	7	3	5.86	0.975	10.55	
Sassy	G	Y	B	14	3	6.455	1.025	9.45	
Sassy	M	N	C	0	4	6.11	1.005	1.45	
Sassy	M	N	C	7	4	5.965	1.07	4.45	
Sassy	M	N	C	14	4	6.77	1.01	1.6	
Smagic	M	Y	D	0	1	5.85	1.1		
Smagic	M	Y	D	7	1	6.36	0.49	6.2	
Smagic	M	Y	D	14	1	5.8	0.92	9.45	280.5
Smagic	G	Y	B	0	2	6.27	1.025	8.75	278
Smagic	G	Y	B	7	2	6.09	0.815	9.5	280
Smagic	G	Y	B	14	2	6.32	0.885	10.75	279
Smagic	G	N	A	0	3	5.595	0.7	8.55	277.5
Smagic	G	N	A	7	3	6.6	0.985	9.75	280
Smagic	G	N	A	14	3	5.89	50.98	10.75	
Smagic	M	N	C	0	4				
Smagic	M	N	C	7	4	5.425	0.89		
Smagic	M	N	C	14	4	5.99	1.08	3.7	
Starlet	G	N	A	0	1	6	1.2		
Starlet	G	N	A	7	1	6.615	0.51	8.05	
Starlet	G	N	A	14	1	6.44	1.055	6.85	280
Starlet	M	N	C	0	2	6.045	0.86	6.95	279.5
Starlet	M	N	C	7	2	6.47	1.005	6.55	279.5
Starlet	M	N	C	14	2	6.275	0.88	5	278
Starlet	G	Y	B	0	3	5.965	0.745	4.9	278.5
Starlet	G	Y	B	7	3	6.64	1.035	7.9	279.5
Starlet	G	Y	B	14	3	6.135	1.04	6.65	
Starlet	M	Y	D	0	4	6.725	1.075	4.9	
Starlet	M	Y	D	7	4	6.25	0.97		

Horse	Fiber	Fat	Diet	Day	Period	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Starlet	M	Y	D	14	4	6.42	1.145	5.55	
Stimpy	M	Y	D	0	1	6.44	0.5	8.7	
Stimpy	M	Y	D	7	1	6.28	1.01	7.4	278
Stimpy	M	Y	D	14	1	6.145	0.975	8.7	281.5
Stimpy	G	Y	B	0	2	6.075	0.87	5.85	277.5
Stimpy	G	Y	B	7	2	6.5	1.015	8.95	278.5
Stimpy	G	Y	B	14	2	6.49	1.055	8.9	278.5
Stimpy	M	N	C	0	3	6.34	0.975	7.65	279
Stimpy	M	N	C	7	3	6.08	1.07	7.75	
Stimpy	M	N	C	14	3	6.1	1.035	7.2	
Stimpy	G	N	A	0	4	5.695	0.98		
Stimpy	G	N	A	7	4	6.19	1.03	4.65	
Stimpy	G	N	A	14	4	6.45	0.985	3.8	
Tank	G	Y	B	0	1	6.68	0.525	5.75	
Tank	G	Y	B	7	1	6.165	1.065	7.85	276
Tank	G	Y	B	14	1	6.1	0.94	2.9	
Tank	M	N	C	0	2	6.595	1.135	7.5	277
Tank	M	N	C	7	2	6.35	1.065	9.15	275.5
Tank	M	N	C	14	2	6.61	1.055	3.9	275
Tank	G	N	A	0	3	6.865	1.17	6.75	276.5
Tank	G	N	A	7	3	6.04	1.035	8.1	
Tank	G	N	A	14	3	6.42	1.11	5.85	
Tank	M	Y	D	0	4	5.965	1.015		272
Tank	M	Y	D	7	4	6.385	1.36	4.3	
Tank	M	Y	D	14	4	6.675	1.16	3.5	

Horse	Fiber	Fat	Diet	Per.	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Goliath	M	N	C	1	Canter 1	35	6.3	7.45	49.95	17.4
Goliath	M	N	C	1	Canter 2	36.5	6.55	7.46	49.1	19.25
Goliath	M	N	C	1	Canter 3	36.5	6.5	7.46	48.35	18.4
Goliath	M	N	C	1	Canter 4	20.5	6.5	7.47	45.15	18.35
Goliath	M	N	C	1	End 1	33	6.1	7.43	48	40.25
Goliath	M	N	C	1	End 2	32.5	6.5	7.44	48.05	36.35
Goliath	M	N	C	1	End 3	30	6	7.43	45.05	35.9
Goliath	M	N	C	1	End 4	34	6.15	7.43	45.85	215.35
Goliath	M	N	C	1	Start 1	29	5.95	7.42	49.35	36.95
Goliath	M	N	C	1	Start 2	27	6.1	7.44	45	37.05
Goliath	M	N	C	1	Start 3	29.5	6.5	7.45	46.55	36.95
Goliath	M	N	C	1	Start 4	41	6.15	7.44	43.35	37.65
Goliath	G	N	A	2	Canter 1	34.5	6.15	7.46	50.85	17.55
Goliath	G	N	A	2	Canter 2	36.5	6.2	7.46	48.7	17.2
Goliath	G	N	A	2	Canter 3	39.5	6.75	7.46	51.1	16.85
Goliath	G	N	A	2	Canter 4	37	6.25	7.46	51.6	17.5
Goliath	G	N	A	2	End 1	33.5	6	7.45	49.55	34.9
Goliath	G	N	A	2	End 2	33.5	6.3	7.46	46.3	38.2
Goliath	G	N	A	2	End 3	38	6.6	7.46	46.1	38.2
Goliath	G	N	A	2	End 4	32	6.25	7.46	48.1	35.6
Goliath	G	N	A	2	Start 1	32	6.2	7.43	50.5	32.75
Goliath	G	N	A	2	Start 2	30.5	5.9	7.43	49.1	36.3
Goliath	G	N	A	2	Start 3	31.5	6.35	7.43	48.45	36.85
Goliath	G	N	A	2	Start 4	34	6.25	7.44	47.55	33.6
Goliath	M	Y	D	3	Canter 1	35	6.35	7.44	53.85	18.6
Goliath	M	Y	D	3	Canter 2	35	6.5	7.45	50.55	17.05
Goliath	M	Y	D	3	Canter 3	34	6.25	7.47	47.95	17.4
Goliath	M	Y	D	3	Canter 4	33	6.45	7.46	49.1	17.4
Goliath	M	Y	D	3	End 1	32	6	7.43	51.5	38
Goliath	M	Y	D	3	End 2	33	6.1	7.42	28.65	36.85
Goliath	M	Y	D	3	End 3	25	6.3	7.42	49.4	34.45
Goliath	M	Y	D	3	End 4	29	6.1	7.42	49.4	35.55
Goliath	M	Y	D	3	Start 1	30	5.9	7.43	49.3	35.6
Goliath	M	Y	D	3	Start 2	31	6	7.43	50.95	36.3
Goliath	M	Y	D	3	Start 3	30.5	6.5	7.43	49.2	39.3
Goliath	M	Y	D	3	Start 4	30.5	6.5	7.42	48.35	33.4
Goliath	G	Y	B	4	Canter 1	35.5	6.45	7.47	51.85	17.7
Goliath	G	Y	B	4	Canter 2	34	3.65	7.48	52.3	16.45
Goliath	G	Y	B	4	Canter 3	34.5	6.4	7.49	49.9	17.75
Goliath	G	Y	B	4	Canter 4	33	6.45	7.50	48.2	17.5
Goliath	G	Y	B	4	End 1	31.5	6.35	7.46	50.35	38.25
Goliath	G	Y	B	4	End 2	33	6.4	7.47	50.25	207.3
Goliath	G	Y	B	4	End 3	32.5	6.25	7.46	49.7	37.15
Goliath	G	Y	B	4	End 4	27.5	6.4			
Goliath	G	Y	B	4	Start 1	28.5	6.45	7.46	51.6	35
Goliath	G	Y	B	4	Start 2	29.5	6.25	7.45	50.1	36.15
Goliath	G	Y	B	4	Start 3	31	6.35	7.45	51.05	34.55
Goliath	G	Y	B	4	Start 4	30.5	6.05	7.45	48.5	35
Sassy	G	N	A	1	Canter 1	38.5	5.85	7.49	42.35	20

Horse	Fiber	Fat	Diet	Period	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Sassy	G	N	A	1	Canter 2	40	6	7.48	41.95	19.85
Sassy	G	N	A	1	Canter 3	41.5	6.15	7.48	42.05	20.05
Sassy	G	N	A	1	Canter 4	42	6.4	7.47	42.9	20.7
Sassy	G	N	A	1	End 1	37.5	5.8	7.45	43.5	38.2
Sassy	G	N	A	1	End 2	37	5.95	7.44	40.9	38
Sassy	G	N	A	1	End 3	38.5	6.1	7.43	43.55	39.05
Sassy	G	N	A	1	End 4	38	6.35	7.43	43.75	50.45
Sassy	G	N	A	1	Start 1	38.5	6.1	7.43	42.85	40.1
Sassy	G	N	A	1	Start 2	37	5.6	7.44	42.9	38.25
Sassy	G	N	A	1	Start 3	36.5	6.2	7.43	40.8	40.85
Sassy	G	N	A	1	Start 4	35	6.1	7.42	42.05	35.6
Sassy	M	Y	D	2	Canter 1	37.5	5.95	7.48	47.25	19.45
Sassy	M	Y	D	2	Canter 2	37.25	6.3	7.50	45.65	20.25
Sassy	M	Y	D	2	Canter 3	37	6.2	7.50	46.25	20.1
Sassy	M	Y	D	2	Canter 4	38	6.15	7.50	46.15	19.6
Sassy	M	Y	D	2	End 1	32.25	5.65	7.46	45.8	39.9
Sassy	M	Y	D	2	End 2	34.25	6.15	7.46	47.1	38.9
Sassy	M	Y	D	2	End 3	34.75	5.95	7.46	47.15	36.1
Sassy	M	Y	D	2	End 4	31.5	6.1	7.47	45.75	36.9
Sassy	M	Y	D	2	Start 1	37.5	5.65	7.44	48.05	36.35
Sassy	M	Y	D	2	Start 2	36.75	5.5	7.44	47	37.35
Sassy	M	Y	D	2	Start 3	35.5	6.25	7.43	48.4	38.3
Sassy	M	Y	D	2	Start 4	32.5	5.85	7.45	46.75	36.3
Sassy	G	Y	B	3	Canter 1	39	6	7.47	47.55	19.1
Sassy	G	Y	B	3	Canter 2	39	6	7.47	44.7	18.85
Sassy	G	Y	B	3	Canter 3	38.5	6.1	7.46	46	19.2
Sassy	G	Y	B	3	Canter 4	38	6	7.46	46.65	19.7
Sassy	G	Y	B	3	End 1	35	5.6	7.44	47.5	40.45
Sassy	G	Y	B	3	End 2	34	5.85	7.44	45	39.75
Sassy	G	Y	B	3	End 3	35	6	7.43	46.3	41.5
Sassy	G	Y	B	3	End 4	34	5.6	7.44	45.5	39.6
Sassy	G	Y	B	3	Start 1	34.5	6.05	7.44	47.6	37.5
Sassy	G	Y	B	3	Start 2	31.5	5.5	7.44	47.2	35.55
Sassy	G	Y	B	3	Start 3	35	6.55	7.41	49.75	34.55
Sassy	G	Y	B	3	Start 4	31	6	7.43	46.1	34.75
Sassy	M	N	C	4	Canter 1	37	6.4	7.43	50.45	19.1
Sassy	M	N	C	4	Canter 2	35	6.5	7.47	49.2	19.6
Sassy	M	N	C	4	Canter 3					
Sassy	M	N	C	4	Canter 4	35.5	6.1	7.46	46.85	20.05
Sassy	M	N	C	4	End 1	32.5	6.05	7.44	49	37.2
Sassy	M	N	C	4	End 2	32	6.05	7.43	50.9	33.65
Sassy	M	N	C	4	End 3	31	6.1	7.43	50.75	37.25
Sassy	M	N	C	4	End 4	31.5	6.05	7.43	47	35.55
Sassy	M	N	C	4	Start 1	30	6.15	7.54	33.25	106.55
Sassy	M	N	C	4	Start 2	30.5	5.95	7.45	46.5	39.65
Sassy	M	N	C	4	Start 3	33.5	6.55	7.41	49.25	38.05
Sassy	M	N	C	4	Start 4	30	5.85	7.56		
Smagic	M	Y	D	1	Canter 1	40.5	6.5	7.48	47.5	21.25
Smagic	M	Y	D	1	Canter 2	39	6.45	7.50	43.75	20.1
Smagic	M	Y	D	1	Canter 3	40.5	6.7	7.49	44.45	24.4

Horse	Fiber	Fat	Diet	Period	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Smagic	M	Y	D	1	Canter 4	40.5	6.7	7.45	52.15	22.95
Smagic	M	Y	D	1	End 1	38	5.95	7.46	42.85	34.65
Smagic	M	Y	D	1	End 2	37	6.4	7.45	45.55	34.55
Smagic	M	Y	D	1	End 3	39	6.45	7.45	46.6	35.8
Smagic	M	Y	D	1	End 4	35	6.15	7.44	46.6	32.6
Smagic	M	Y	D	1	Start 1	41.5	5.9	7.49	43.85	38.4
Smagic	M	Y	D	1	Start 2	33	6.1	7.45	43.65	37.35
Smagic	M	Y	D	1	Start 3	35.5	6.55	7.45	48.4	41.7
Smagic	M	Y	D	1	Start 4	37	6.45	7.43	48.6	35.45
Smagic	G	Y	B	2	Canter 1	36.5	6.35	7.73	47.9	18.9
Smagic	G	Y	B	2	Canter 2	40	6.5	7.49	44.55	20.6
Smagic	G	Y	B	2	Canter 3	41	6.8	7.48	47.45	19.7
Smagic	G	Y	B	2	Canter 4	40.5	6.35	7.46	48.55	19.95
Smagic	G	Y	B	2	End 1	37	6.3	7.44	47.45	38.65
Smagic	G	Y	B	2	End 2	36.5	6.35	7.44	46.15	36.6
Smagic	G	Y	B	2	End 3	38.5	6.6	7.43	51.65	34.4
Smagic	G	Y	B	2	End 4	38	6.3	7.44	50.4	36.55
Smagic	G	Y	B	2	Start 1	35	6.1	7.44	49.4	34.05
Smagic	G	Y	B	2	Start 2	35	6.3	7.42	47.5	38.85
Smagic	G	Y	B	2	Start 3	41.5	6.6	7.46	44.75	46.25
Smagic	G	Y	B	2	Start 4	36	6.4	7.43	49.55	33.3
Smagic	G	N	A	3	Canter 1	38.5	6	7.48	46.45	20.7
Smagic	G	N	A	3	Canter 2	38.5	6.35	7.47	47.05	19
Smagic	G	N	A	3	Canter 3	38	6.35	7.48	47.1	19.2
Smagic	G	N	A	3	Canter 4	38	6.05	7.47	47.4	20.3
Smagic	G	N	A	3	End 1	33.5	5.95	7.42	49.55	37.65
Smagic	G	N	A	3	End 2	36	6.6	7.44	48.65	37.3
Smagic	G	N	A	3	End 3	34.5	6.05	7.43	49.4	35.85
Smagic	G	N	A	3	End 4	34	6	7.44	46.6	35.55
Smagic	G	N	A	3	Start 1	37.5	6.05	7.43	50.05	35.5
Smagic	G	N	A	3	Start 2	36.5	6	7.43	48.05	37
Smagic	G	N	A	3	Start 3	37	6.45	7.42	48.55	38.75
Smagic	G	N	A	3	Start 4	35	6.15	7.43	48.6	35.95
Smagic	M	N	C	4	Canter 1	35	6.2	7.44	52.3	20.35
Smagic	M	N	C	4	Canter 2	36.5	6.4	7.44	53.25	20.75
Smagic	M	N	C	4	Canter 3	34	6.05	7.45	50.2	20.7
Smagic	M	N	C	4	Canter 4	35.5	6.15	7.45	49.35	19.95
Smagic	M	N	C	4	End 1	34	6.05	7.41	52.3	36
Smagic	M	N	C	4	End 2	34	6.6	7.43	50.7	40.15
Smagic	M	N	C	4	End 3	35.5	6.3	7.42	51.1	207.65
Smagic	M	N	C	4	End 4	34.5	6.2	7.41	50.5	36.9
Smagic	M	N	C	4	Start 1	28.5	5.95	7.42	51	35.05
Smagic	M	N	C	4	Start 2	34	6.1	7.41	51.6	36.55
Smagic	M	N	C	4	Start 3	36.5	6.55	7.41	48.75	37.3
Smagic	M	N	C	4	Start 4	33.5	6.2	7.44	49.55	27.15
Starlet	G	N	A	1	Canter 1	37.75	6.65	7.49	45.7	26.2
Starlet	G	N	A	1	Canter 2	37	6.8	7.50	45.9	20.25
Starlet	G	N	A	1	Canter 3	37	6.85	7.47	45.55	20
Starlet	G	N	A	1	Canter 4	19	6.5	7.48	43.1	19.8
Starlet	G	N	A	1	End 1	32	6.4	7.46	46.05	50.2

Horse	Fiber	Fat	Diet	Period	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Starlet	G	N	A	1	End 2	33	6.55	7.45	47.05	37.45
Starlet	G	N	A	1	End 3	34	6.8	7.45	47.1	37.3
Starlet	G	N	A	1	End 4	30	6	7.45	41.05	40.65
Starlet	G	N	A	1	Start 1	35.25	6.75	7.44	46.6	37.2
Starlet	G	N	A	1	Start 2	31.5	6.4	7.44	47.9	34.45
Starlet	G	N	A	1	Start 3	33	7.05	7.43	46.45	34.45
Starlet	G	N	A	1	Start 4	31	6.35	7.44	44.25	34.6
Starlet	M	N	C	2	Canter 1	35.5	6.5	7.44	52.65	21.35
Starlet	M	N	C	2	Canter 2	36	6.85	7.44	52.15	23.4
Starlet	M	N	C	2	Canter 3	35	6.8	7.45	51.9	24.05
Starlet	M	N	C	2	Canter 4	34	6.6	7.47	47.7	18.8
Starlet	M	N	C	2	End 1	31.5	6.4	7.43	49.5	41.1
Starlet	M	N	C	2	End 2	32.5	6.55	7.44	50.15	38.85
Starlet	M	N	C	2	End 3	33.5	6.5	7.43	49.9	36.55
Starlet	M	N	C	2	End 4	32	6.5	7.45	46.45	40.45
Starlet	M	N	C	2	Start 1	31.5	6.35	7.42	52.75	36.65
Starlet	M	N	C	2	Start 2	33	6.5	7.42	49.15	40.6
Starlet	M	N	C	2	Start 3	32.5	6.7	7.42	50	36.05
Starlet	M	N	C	2	Start 4	32.5	6.3	7.42	48.3	35.1
Starlet	G	Y	B	3	Canter 1	34	6.45	7.46	46.65	25.15
Starlet	G	Y	B	3	Canter 2	35	6.9	7.47	49.75	18.65
Starlet	G	Y	B	3	Canter 3	36	7	7.47	49.6	19.1
Starlet	G	Y	B	3	Canter 4	35	6.55	7.48	47.35	17.45
Starlet	G	Y	B	3	End 1	31	6.4	7.44	48.4	38.6
Starlet	G	Y	B	3	End 2	31	6.4	7.46	47.75	39.05
Starlet	G	Y	B	3	End 3	33	6.75	7.45	47.25	39.2
Starlet	G	Y	B	3	End 4	33	6.55	7.45	46.75	37.5
Starlet	G	Y	B	3	Start 1	31	6.3	7.42	51	35.4
Starlet	G	Y	B	3	Start 2	29.5	6.3	7.43	48.05	32.85
Starlet	G	Y	B	3	Start 3	30	6.9	7.41	50.6	33.3
Starlet	G	Y	B	3	Start 4	31	6.6	7.45	46.7	34.9
Starlet	M	Y	D	4	Canter 1	33	6.65	7.45	52.8	20.75
Starlet	M	Y	D	4	Canter 2	32	6.6	7.46	51.4	19.5
Starlet	M	Y	D	4	Canter 3	33.5	6.9	7.46	49.55	20.6
Starlet	M	Y	D	4	Canter 4	35	6.7	7.44	50.1	20.35
Starlet	M	Y	D	4	End 1	32.5	6.5	7.44	50.9	37.65
Starlet	M	Y	D	4	End 2	31	6.6	7.43	51.7	35.35
Starlet	M	Y	D	4	End 3	28.5	6.3	7.42	48.5	35.2
Starlet	M	Y	D	4	End 4	32.5	6.75	7.42	49.15	39.75
Starlet	M	Y	D	4	Start 1	29.5	6.4	7.41	52.55	37.1
Starlet	M	Y	D	4	Start 2	29	6.45	7.43	51.35	35.4
Starlet	M	Y	D	4	Start 3	31.5	6.65	7.41	50.65	33.9
Starlet	M	Y	D	4	Start 4	29	6.45	7.42	46.75	40
Stimpy	M	Y	D	1	Canter 1	35	6.9	7.51	39.2	19.75
Stimpy	M	Y	D	1	Canter 2	32	6.8	7.72		
Stimpy	M	Y	D	1	Canter 3	35	6.75	7.50	42.4	18.1
Stimpy	M	Y	D	1	Canter 4	36.5	6.6	7.49	41.3	18.5
Stimpy	M	Y	D	1	End 1	31	6.8	7.50	35.65	44.05
Stimpy	M	Y	D	1	End 2	31	6.45	7.53		
Stimpy	M	Y	D	1	End 3	33	6.45	7.47	41.25	31.05

Horse	Fiber	Fat	Diet	Period	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Stimpy	M	Y	D	1	End 4	31.5	6.5	7.46	40.9	32.7
Stimpy	M	Y	D	1	Start 1	31.75	6.5	7.44	46.8	39
Stimpy	M	Y	D	1	Start 2	34.5	6.8	7.42	44.42	35.95
Stimpy	M	Y	D	1	Start 3	34	6.65	7.44	45.45	34.95
Stimpy	M	Y	D	1	Start 4	32.5	6.5	7.43	45.25	32.8
Stimpy	G	Y	B	2	Canter 1	34	6.5	7.51	43.95	18.75
Stimpy	G	Y	B	2	Canter 2	33	6.4	7.49	40.5	32.7
Stimpy	G	Y	B	2	Canter 3	35	6.6	7.50	43.3	17.75
Stimpy	G	Y	B	2	Canter 4	33.5	6.6	7.54	38.65	17.95
Stimpy	G	Y	B	2	End 1	31.5	6.45	7.48	41.65	34.45
Stimpy	G	Y	B	2	End 2	33	6.4	7.57	32.75	22.95
Stimpy	G	Y	B	2	End 3	32.5	6.4	7.48	42.4	32.4
Stimpy	G	Y	B	2	End 4	31	6.15	7.48	39.45	30
Stimpy	G	Y	B	2	Start 1	33	6.4	7.47	46.05	35.75
Stimpy	G	Y	B	2	Start 2	31	6.1	7.45	44.25	35.75
Stimpy	G	Y	B	2	Start 3	29.5	6.2	7.45	43.95	35.05
Stimpy	G	Y	B	2	Start 4	31	6.3	7.46	43	30.3
Stimpy	M	N	C	3	Canter 1	32	6.4	7.48	44.5	19.15
Stimpy	M	N	C	3	Canter 2	36	6.7	7.49	46.35	18.2
Stimpy	M	N	C	3	Canter 3	33.5	6.1	7.49	45.35	18.6
Stimpy	M	N	C	3	Canter 4	32	6.15	7.48	44.55	17.8
Stimpy	M	N	C	3	End 1	30	6.4	7.44	48.2	31.1
Stimpy	M	N	C	3	End 2	34.5	6.5	7.46	44.15	33.6
Stimpy	M	N	C	3	End 3	28	5.85	7.44	47.4	32.25
Stimpy	M	N	C	3	End 4	28.5	6.1	7.45	45.95	33.25
Stimpy	M	N	C	3	Start 1	33	6.3	7.43	51.15	37.4
Stimpy	M	N	C	3	Start 2	30.5	6.05	7.42	49	32.1
Stimpy	M	N	C	3	Start 3	32.5	6.5	7.43	47.05	34.95
Stimpy	M	N	C	3	Start 4	30	5.75	7.43	271.45	33.65
Stimpy	G	N	A	4	Canter 1	33.5	6.05	7.52	41.7	18.9
Stimpy	G	N	A	4	Canter 2	34.5	6.25	7.51	40.25	18.25
Stimpy	G	N	A	4	Canter 3	35	6.4	7.55	36.65	18
Stimpy	G	N	A	4	Canter 4	35.5	6.2	7.50	42.2	17.5
Stimpy	G	N	A	4	End 1	30	5.9	7.45	42.55	33.65
Stimpy	G	N	A	4	End 2	34	6	7.46	44.5	36.5
Stimpy	G	N	A	4	End 3	33	6	7.48	41.25	31.15
Stimpy	G	N	A	4	End 4	34	6.05	7.46	43.7	32.35
Stimpy	G	N	A	4	Start 1	32	6.1	7.45	46.35	36.4
Stimpy	G	N	A	4	Start 2	30.5	5.85	7.44	43.55	36.65
Stimpy	G	N	A	4	Start 3	29.5	6.1	7.56		
Stimpy	G	N	A	4	Start 4	32	6.1	7.53		
Tank	G	Y	B	1	Canter 1	39	6	7.44	48.45	20.2
Tank	G	Y	B	1	Canter 2	40	6.4	7.45	49.15	23.6
Tank	G	Y	B	1	Canter 3	39.5	6.45	7.45	47.75	18.5
Tank	G	Y	B	1	Canter 4	39	6.4	7.45	48.15	21.1
Tank	G	Y	B	1	End 1	33.5	5.9	7.42	47.35	39.3
Tank	G	Y	B	1	End 2	35	6.2	7.43	49.1	35.95
Tank	G	Y	B	1	End 3	35.5	6	7.43	47.55	37.95
Tank	G	Y	B	1	End 4	34.5	6	7.42	45.65	38
Tank	G	Y	B	1	Start 1	32	5.9	7.40	51.8	36.85

Horse	Fiber	Fat	Diet	Period	Time	PCV (%)	TS (mg/dl)	pH	pCO2 (mmHg)	pO2 (mmHg)
Tank	G	Y	B	1	Start 2	33	5.9	7.40	48.2	36.05
Tank	G	Y	B	1	Start 3	32	6.25	7.40	50.85	18.45
Tank	G	Y	B	1	Start 4	33	6	7.40	47.05	37.55
Tank	M	N	C	2	Canter 1	37.5	6	7.38	59.85	16.6
Tank	M	N	C	2	Canter 2	36.5	5.85	7.45	50.85	18.3
Tank	M	N	C	2	Canter 3	37.5	6.15	7.47	50.8	18.75
Tank	M	N	C	2	Canter 4	38	6.05	7.49	47.5	18.95
Tank	M	N	C	2	End 1	33.5	5.7	7.41	52.9	37.9
Tank	M	N	C	2	End 2	33	5.95	7.44	50.25	38.15
Tank	M	N	C	2	End 3	35	5.8	7.43	51.3	36
Tank	M	N	C	2	End 4	35	6.1	7.45	48.9	39.3
Tank	M	N	C	2	Start 1	31	6	7.41	51.4	36.2
Tank	M	N	C	2	Start 2	31	5.75	7.39	55.85	36.55
Tank	M	N	C	2	Start 3	31	5.9	7.41	53	33.3
Tank	M	N	C	2	Start 4	32	5.95	7.43	51.15	33.4
Tank	G	N	A	3	Canter 1	36	5.6	7.48	48.6	17.85
Tank	G	N	A	3	Canter 2	35.5	5.85	7.47	50.7	16.55
Tank	G	N	A	3	Canter 3	38	5.7	7.49	46.8	18.05
Tank	G	N	A	3	Canter 4	37.5	5.8	7.50	45.95	17.4
Tank	G	N	A	3	End 1	35	5.45	7.52	37.05	42.75
Tank	G	N	A	3	End 2	32.5	5.55	7.45	50.45	36.85
Tank	G	N	A	3	End 3	35.5	5.65	7.45	47.95	33.2
Tank	G	N	A	3	End 4	33.5	5.6	7.45	48.3	36.55
Tank	G	N	A	3	Start 1	35	5.6	7.45	43.95	43.25
Tank	G	N	A	3	Start 2	34	5.9	7.45	48.1	38.6
Tank	G	N	A	3	Start 3	32	5.8	7.42	51.2	32.55
Tank	G	N	A	3	Start 4	32.5	5.5	7.43	48.05	33
Tank	M	Y	D	4	Canter 1	35	6	7.45	53.3	16.95
Tank	M	Y	D	4	Canter 2	34.5	6.1	7.45	51.05	16.1
Tank	M	Y	D	4	Canter 3	36.5	6.25	7.47	49	17.3
Tank	M	Y	D	4	Canter 4	37	6.2	7.47	49.35	17.65
Tank	M	Y	D	4	End 1	30	5.6	7.55		
Tank	M	Y	D	4	End 2	29.5	5.85	7.43	51.8	34.45
Tank	M	Y	D	4	End 3	34	6.05	7.43	50.8	37.65
Tank	M	Y	D	4	End 4	34	6.1	7.43	51.1	37.75
Tank	M	Y	D	4	Start 1	28.5	5.7	7.51		
Tank	M	Y	D	4	Start 2	29.5	5.95	7.43	53.1	34.9
Tank	M	Y	D	4	Start 3	28.5	5.95	7.40	53.25	34.55
Tank	M	Y	D	4	Start 4	31	6	7.41	49.1	37.45

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Goliath	M	N	C	1	Canter 1	140	4.15	103.5	5.39	0.8
Goliath	M	N	C	1	Canter 2	143	4	104.5	5.29	0.8
Goliath	M	N	C	1	Canter 3	141.5	4.3	102.5	6.06	0.945
Goliath	M	N	C	1	Canter 4	141	3.9	103	5.38	0.875
Goliath	M	N	C	1	End 1	141	3.05	103.5	5.245	0.75
Goliath	M	N	C	1	End 2	140	3.1	102	6.245	1.005
Goliath	M	N	C	1	End 3	137.5	3.1	102.5	5.55	0.825
Goliath	M	N	C	1	End 4	138	3.05	102	4.98	0.785
Goliath	M	N	C	1	Start 1	137.5	3.2	101	5.91	0.92
Goliath	M	N	C	1	Start 2	140	2.8	104.5	5.39	0.755
Goliath	M	N	C	1	Start 3	140.5	3	104	5.87	0.86
Goliath	M	N	C	1	Start 4	139	15.95	104.5	5.665	0.85
Goliath	G	N	A	2	Canter 1	140.5	4.7	102.5	5.835	0.74
Goliath	G	N	A	2	Canter 2	140	4.55	100.5	5.775	0.785
Goliath	G	N	A	2	Canter 3	140	5	97.5	6.445	1
Goliath	G	N	A	2	Canter 4	140	4.55	98.5	5.95	0.82
Goliath	G	N	A	2	End 1	137	3.5	100.5	6.2	0.825
Goliath	G	N	A	2	End 2	136.5	3.25	101	5.73	0.74
Goliath	G	N	A	2	End 3	137	3.3	99.5	5.8	0.755
Goliath	G	N	A	2	End 4	137	17.6	98	5.805	0.75
Goliath	G	N	A	2	Start 1	138	3.7	101.5	6.425	0.875
Goliath	G	N	A	2	Start 2	136	3.4	100	6.45	0.865
Goliath	G	N	A	2	Start 3	136.5	3.7	101	6.345	0.895
Goliath	G	N	A	2	Start 4	135.5	3.3	99.5	6.035	0.74
Goliath	M	Y	D	3	Canter 1	139	4.6	102	6.235	1.04
Goliath	M	Y	D	3	Canter 2	140.5	4.5	101.5	6.13	1.075
Goliath	M	Y	D	3	Canter 3	141	4.35	52.5	5.66	0.905
Goliath	M	Y	D	3	Canter 4	141	4.45	102.5	6.215	1.105
Goliath	M	Y	D	3	End 1	138	3.3	101	5.865	0.965
Goliath	M	Y	D	3	End 2	137	3.2	99.5	6.09	1.07
Goliath	M	Y	D	3	End 3	138.5	3.5	99.5	6.08	1.075
Goliath	M	Y	D	3	End 4	137.5	3.25	102	5.77	0.96
Goliath	M	Y	D	3	Start 1	138.5	3.5	104	5.675	0.905
Goliath	M	Y	D	3	Start 2	136.5	3.2	100	6.395	1.085
Goliath	M	Y	D	3	Start 3	138	3.5	53	6.625	1.145
Goliath	M	Y	D	3	Start 4	137	3.25	100.5	6.585	1.115
Goliath	G	Y	B	4	Canter 1	138.5	4.75	101.5	6	0.865
Goliath	G	Y	B	4	Canter 2	136.5	4.8	101	6.215	0.965
Goliath	G	Y	B	4	Canter 3	137.5	4.8	101.5	6.055	0.87
Goliath	G	Y	B	4	Canter 4	136.5	4.5	100.5	5.905	0.9
Goliath	G	Y	B	4	End 1	135.5	3.5	102	5.91	0.84
Goliath	G	Y	B	4	End 2	134.5	3.7	98.5	6.42	1.045
Goliath	G	Y	B	4	End 3	134.5	3.7	99.5	6.185	0.91
Goliath	G	Y	B	4	End 4					
Goliath	G	Y	B	4	Start 1	137.5	4.1	102	6.345	1.015
Goliath	G	Y	B	4	Start 2	134.5	3.55	100.5	6.405	0.9
Goliath	G	Y	B	4	Start 3	135	3.75	102	6.405	0.95
Goliath	G	Y	B	4	Start 4	133	3.4	99	6.475	1.005
Sassy	G	N	A	1	Canter 1	142	4.8	106.5	5.815	0.83

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Sassy	G	N	A	1	Canter 2	140.5	4.55	103.5	6.135	0.95
Sassy	G	N	A	1	Canter 3	142.5	4.9	104.5	5.995	0.905
Sassy	G	N	A	1	Canter 4	140.5	4.75	101.5	6.23	1.105
Sassy	G	N	A	1	End 1	140	4	104.5	6.195	0.915
Sassy	G	N	A	1	End 2	138.5	3.5	105	5.8	0.905
Sassy	G	N	A	1	End 3	140.5	3.75	104.5	5.875	0.88
Sassy	G	N	A	1	End 4	139.5	3.45	104.5	5.495	0.875
Sassy	G	N	A	1	Start 1	140	4.4	106	6.43	1.03
Sassy	G	N	A	1	Start 2	140	6.7	104.5	5.71	0.87
Sassy	G	N	A	1	Start 3	138.5	3.9	107.5	6.165	0.96
Sassy	G	N	A	1	Start 4	138.5	3.6	105	6.025	0.865
Sassy	M	Y	D	2	Canter 1	139	4.5	103	6.14	0.845
Sassy	M	Y	D	2	Canter 2	139	4.45	101	6.37	0.975
Sassy	M	Y	D	2	Canter 3	140	4.7	104	6.275	0.84
Sassy	M	Y	D	2	Canter 4	140	4.35	102	6.275	0.835
Sassy	M	Y	D	2	End 1	139	3.25	101.5	6.035	0.81
Sassy	M	Y	D	2	End 2	137.5	3.3	102	6.24	0.935
Sassy	M	Y	D	2	End 3	138.5	3.5	102.5	6.185	0.82
Sassy	M	Y	D	2	End 4	139	3.4	101.5	6.185	0.77
Sassy	M	Y	D	2	Start 1	137	3.5	103.5	6.025	0.84
Sassy	M	Y	D	2	Start 2	136.5	3.3	101	6.56	0.96
Sassy	M	Y	D	2	Start 3	140	3.6	103.5	6.815	0.985
Sassy	M	Y	D	2	Start 4	139	3.4	101.5	6.6	0.845
Sassy	G	Y	B	3	Canter 1	141	4.85	105	6.315	0.99
Sassy	G	Y	B	3	Canter 2	139	4.6	104	6.13	1.015
Sassy	G	Y	B	3	Canter 3	140	4.9	105.5	6.25	0.945
Sassy	G	Y	B	3	Canter 4	139	4.75	103.5	6.145	1
Sassy	G	Y	B	3	End 1	138	3.7	106	6.025	0.905
Sassy	G	Y	B	3	End 2	137.5	3.4	103.5	5.88	0.92
Sassy	G	Y	B	3	End 3	138	4	105.5	6.135	0.925
Sassy	G	Y	B	3	End 4	137	3.55	105.5	5.545	0.83
Sassy	G	Y	B	3	Start 1	139.5	4.3	106.5	6.365	1.005
Sassy	G	Y	B	3	Start 2	136.5	3.7	104.5	6.435	1
Sassy	G	Y	B	3	Start 3	139	4.35	106	7.125	1.225
Sassy	G	Y	B	3	Start 4	137	3.8	104	6.315	0.965
Sassy	M	N	C	4	Canter 1	142.5	4.85	106	6.26	1.04
Sassy	M	N	C	4	Canter 2	140.5	4.65	103.5	6.585	1.16
Sassy	M	N	C	4	Canter 3					
Sassy	M	N	C	4	Canter 4	143	4.25	103	6.235	1.035
Sassy	M	N	C	4	End 1	138	3.75	105	6.285	1.195
Sassy	M	N	C	4	End 2	137.5	3.4	105	6.325	1.07
Sassy	M	N	C	4	End 3	140	3.8	105	6.475	0.99
Sassy	M	N	C	4	End 4	140	3.35	105	5.86	0.815
Sassy	M	N	C	4	Start 1	141	4.05	110	6.245	1.105
Sassy	M	N	C	4	Start 2	137	3.55	106	6.4	1.145
Sassy	M	N	C	4	Start 3	140.5	3.75	106	6.78	1.115
Sassy	M	N	C	4	Start 4	136.5	3.45	108	6.38	1.015
Smagic	M	Y	D	1	Canter 1	140	4.45	102	6.09	0.92
Smagic	M	Y	D	1	Canter 2	141.5	4.1	103	5.495	0.815
Smagic	M	Y	D	1	Canter 3	141	4.8	102	6.575	1.095

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Smagic	M	Y	D	1	Canter 4	140	4.45	101.5	6.295	1.06
Smagic	M	Y	D	1	End 1	140	2.95	106	4.74	0.595
Smagic	M	Y	D	1	End 2	140	3.2	101.5	5.825	0.885
Smagic	M	Y	D	1	End 3	140	3.65	102	6.3	0.555
Smagic	M	Y	D	1	End 4	139.5	3.45	103.5	5.67	0.83
Smagic	M	Y	D	1	Start 1	139.5	3.25	103.5	5.46	0.68
Smagic	M	Y	D	1	Start 2	140	3.1	105.5	5.34	0.72
Smagic	M	Y	D	1	Start 3	140.5	3.7	103.5	6.505	1.0575
Smagic	M	Y	D	1	Start 4	139.5	3.55	103	6.495	1.09
Smagic	G	Y	B	2	Canter 1	141	4.4	103.5	5.59	0.655
Smagic	G	Y	B	2	Canter 2	139	4.35	101.5	5.77	0.83
Smagic	G	Y	B	2	Canter 3	141	4.75	101	6.335	0.96
Smagic	G	Y	B	2	Canter 4	143	4.4	102	5.755	0.84
Smagic	G	Y	B	2	End 1	138.5	3.85	101.5	6.31	0.865
Smagic	G	Y	B	2	End 2	138	3.6	101	6.015	0.885
Smagic	G	Y	B	2	End 3	138.5	4	102.5	6.35	0.965
Smagic	G	Y	B	2	End 4	139	3.7	102	6.025	0.865
Smagic	G	Y	B	2	Start 1	140	3.65	102.5	5.955	0.74
Smagic	G	Y	B	2	Start 2	138	3.75	100.5	6.445	0.915
Smagic	G	Y	B	2	Start 3	140	3.95	103.5	6.22	0.92
Smagic	G	Y	B	2	Start 4	139.5	3.7	102.5	6.38	0.92
Smagic	G	N	A	3	Canter 1	139.5	4.6	105	5.725	0.875
Smagic	G	N	A	3	Canter 2	142	4.4	104	5.525	0.88
Smagic	G	N	A	3	Canter 3	140	4.9	103	6.17	0.97
Smagic	G	N	A	3	Canter 4	140	4.35	104	5.68	0.875
Smagic	G	N	A	3	End 1	138.5	3.8	102.5	309.53	0.92
Smagic	G	N	A	3	End 2	139	3.55	103	5.715	0.89
Smagic	G	N	A	3	End 3	138.5	3.9	104	5.94	0.91
Smagic	G	N	A	3	End 4	139.5	3.4	103.5	5.465	0.76
Smagic	G	N	A	3	Start 1	140.5	4.1	105	5.855	0.87
Smagic	G	N	A	3	Start 2	138	3.75	102	6.36	1
Smagic	G	N	A	3	Start 3	140	3.7	103.5	6.215	0.945
Smagic	G	N	A	3	Start 4	139	3.7	103.5	6.13	0.95
Smagic	M	N	C	4	Canter 1	145	4.35	106.5	5.83	0.89
Smagic	M	N	C	4	Canter 2	143.5	4.5	102.5	6.555	1.27
Smagic	M	N	C	4	Canter 3	147	4.3	106	6.4	1.035
Smagic	M	N	C	4	Canter 4	143	4.4	105	6	1.015
Smagic	M	N	C	4	End 1	141	3.4	105.5	5.855	0.915
Smagic	M	N	C	4	End 2	142.5	3.35	106	5.88	0.95
Smagic	M	N	C	4	End 3	142.5	3.4	105.5	6.085	0.925
Smagic	M	N	C	4	End 4	141	3.4	106.5	5.955	0.9
Smagic	M	N	C	4	Start 1	142	3.7	107.5	6.01	0.87
Smagic	M	N	C	4	Start 2	141	3.4	106	6.28	1.015
Smagic	M	N	C	4	Start 3	144	3.45	106.5	6.48	1.1
Smagic	M	N	C	4	Start 4	142.5	3.95	105	6.08	0.965
Starlet	G	N	A	1	Canter 1	141.5	23.15	105	5.93	0.935
Starlet	G	N	A	1	Canter 2	142.5	4.45	101.5	5.86	0.935
Starlet	G	N	A	1	Canter 3	143	4.95	105.5	6.05	0.925
Starlet	G	N	A	1	Canter 4	141	4.5	104	5.385	0.81
Starlet	G	N	A	1	End 1	141.5	3.9	57	32.4	0.845

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Starlet	G	N	A	1	End 2	142	3.35	101	5.655	0.865
Starlet	G	N	A	1	End 3	140	4.1	104.5	6.18	0.94
Starlet	G	N	A	1	End 4	141	3.1	107.5	4.24	0.52
Starlet	G	N	A	1	Start 1	140	4.05	106	6.32	1.01
Starlet	G	N	A	1	Start 2	139.5	3.7	103.5	6.55	0.505
Starlet	G	N	A	1	Start 3	140	3.9	100	6.1	0.915
Starlet	G	N	A	1	Start 4	139.5	3.65	105.5	5.445	0.7
Starlet	M	N	C	2	Canter 1	141.5	4.6	103	6.43	0.98
Starlet	M	N	C	2	Canter 2	142.5	4.6	101	6.48	1.005
Starlet	M	N	C	2	Canter 3	143.5	4.85	103	6.45	0.97
Starlet	M	N	C	2	Canter 4	142	4.5	102.5	6.165	0.89
Starlet	M	N	C	2	End 1	140	3.6	102.5	6.48	0.97
Starlet	M	N	C	2	End 2	140	3.5	102	6.355	1.055
Starlet	M	N	C	2	End 3	141	3.8	103	6.375	0.94
Starlet	M	N	C	2	End 4	140	3.5	102.5	6.175	0.895
Starlet	M	N	C	2	Start 1	138.5	3.7	104	6.71	1.06
Starlet	M	N	C	2	Start 2	139	3.5	102.5	6.99	1.085
Starlet	M	N	C	2	Start 3	141.5	3.65	104.5	6.73	1.06
Starlet	M	N	C	2	Start 4	138.5	3.4	103.5	6.69	0.96
Starlet	G	Y	B	3	Canter 1	141.5	4.2	104	5.72	0.915
Starlet	G	Y	B	3	Canter 2	143	4.7	103	5.82	1.015
Starlet	G	Y	B	3	Canter 3	144	4.95	104	6.015	1.045
Starlet	G	Y	B	3	Canter 4	142	4.75	103	6.02	1.025
Starlet	G	Y	B	3	End 1	139	3.65	104.5	6.005	0.985
Starlet	G	Y	B	3	End 2	140.5	3.4	102.5	5.495	0.925
Starlet	G	Y	B	3	End 3	141.5	3.75	104.5	5.85	0.96
Starlet	G	Y	B	3	End 4	139.5	3.6	102.5	5.91	1.005
Starlet	G	Y	B	3	Start 1	140.5	4	105.5	6.27	1.035
Starlet	G	Y	B	3	Start 2	139	3.6	103	6.4	1.065
Starlet	G	Y	B	3	Start 3	142	3.7	104	6.655	1.215
Starlet	G	Y	B	3	Start 4	139	3.55	104	6.23	1.045
Starlet	M	Y	D	4	Canter 1	144	4.7	105.5	5.925	0.87
Starlet	M	Y	D	4	Canter 2	144	4.4	104.5	6.11	0.975
Starlet	M	Y	D	4	Canter 3	144	4.6	107	6.085	1.045
Starlet	M	Y	D	4	Canter 4	143.5	4.4	105.5	6.175	1.085
Starlet	M	Y	D	4	End 1	142	3.5	104	3.005	0.885
Starlet	M	Y	D	4	End 2	141	18.15	104	6.17	0.985
Starlet	M	Y	D	4	End 3	140.5	3.3	108	6	0.83
Starlet	M	Y	D	4	End 4	142.5	3.45	105.5	6.08	0.9
Starlet	M	Y	D	4	Start 1	139.5	3.7	104	6.265	1.105
Starlet	M	Y	D	4	Start 2	142	3.35	105	6.28	0.89
Starlet	M	Y	D	4	Start 3	143.5	19.85	108	6.415	1.115
Starlet	M	Y	D	4	Start 4	142.5	3.2	109	5.855	0.755
Stimpy	M	Y	D	1	Canter 1	141	4.3	105	5.86	0.905
Stimpy	M	Y	D	1	Canter 2	140	4	109	5.24	0.77
Stimpy	M	Y	D	1	Canter 3	143	4.25	105	5.685	0.86
Stimpy	M	Y	D	1	Canter 4	142.5	4.15	103.5	5.48	0.805
Stimpy	M	Y	D	1	End 1	138	3.3	103	6.18	0.97
Stimpy	M	Y	D	1	End 2	140	2.85	105.5	5.525	0.8
Stimpy	M	Y	D	1	End 3	142	3.05	105	5.2	0.735

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Stimpy	M	Y	D	1	End 4	140.5	3	103.5	5.415	0.795
Stimpy	M	Y	D	1	Start 1	141	3.65	106.5	5.69	0.82
Stimpy	M	Y	D	1	Start 2	140	3.3	102	6.45	0.995
Stimpy	M	Y	D	1	Start 3	142	3.5	104.5	6.255	0.91
Stimpy	M	Y	D	1	Start 4	141.5	3	103	6.07	0.855
Stimpy	G	Y	B	2	Canter 1	142	4.35	105.5	5.72	0.71
Stimpy	G	Y	B	2	Canter 2	141	3.2	107	5.56	0.72
Stimpy	G	Y	B	2	Canter 3	142.5	4.5	103.5	6.17	0.985
Stimpy	G	Y	B	2	Canter 4	141	4.3	104	5.605	0.85
Stimpy	G	Y	B	2	End 1	141	3.3	105.5	5.52	0.655
Stimpy	G	Y	B	2	End 2	141	3.55	109.5	5.19	0.675
Stimpy	G	Y	B	2	End 3	140	3.3	104.5	5.935	0.86
Stimpy	G	Y	B	2	End 4	140	3	105	5.03	0.65
Stimpy	G	Y	B	2	Start 1	141.5	3.65	106.5	5.955	0.395
Stimpy	G	Y	B	2	Start 2	138.5	3.4	105	6.175	0.775
Stimpy	G	Y	B	2	Start 3	141	3.6	106.5	5.65	0.825
Stimpy	G	Y	B	2	Start 4	139	3.3	104.5	5.825	0.8
Stimpy	M	N	C	3	Canter 1	140.5	4.15	104	5.63	0.78
Stimpy	M	N	C	3	Canter 2	138.5	4.35	103	6.38	1.09
Stimpy	M	N	C	3	Canter 3	142	4.3	105.5	5.735	0.855
Stimpy	M	N	C	3	Canter 4	142.5	4	106.5	5.53	0.855
Stimpy	M	N	C	3	End 1	138	3.3	102	6.125	0.925
Stimpy	M	N	C	3	End 2	139	2.95	106	5.17	0.69
Stimpy	M	N	C	3	End 3	140	3.3	105	5.605	0.83
Stimpy	M	N	C	3	End 4	140	3.2	105	5.88	0.95
Stimpy	M	N	C	3	Start 1	139	3.5	104.5	5.855	0.885
Stimpy	M	N	C	3	Start 2	138.5	3.2	101	6.385	0.96
Stimpy	M	N	C	3	Start 3	141.5	3.4	106	6.13	0.91
Stimpy	M	N	C	3	Start 4	138	3.25	105	5.825	0.845
Stimpy	G	N	A	4	Canter 1	141	4.6	105	5.675	0.93
Stimpy	G	N	A	4	Canter 2	141	4.15	104.5	5.735	0.97
Stimpy	G	N	A	4	Canter 3	139	4.4	100	5.765	1.015
Stimpy	G	N	A	4	Canter 4	141	3.95	100.5	5.315	0.955
Stimpy	G	N	A	4	End 1	139	3.55	106	5.7	0.805
Stimpy	G	N	A	4	End 2	138	3.4	102	5.815	0.935
Stimpy	G	N	A	4	End 3	138	3.2	100.5	5.325	0.86
Stimpy	G	N	A	4	End 4	138.5	2.9	100.5	5.205	0.89
Stimpy	G	N	A	4	Start 1	140.5	4.25	107	5.895	0.975
Stimpy	G	N	A	4	Start 2	139	3.55	105	6.12	0.98
Stimpy	G	N	A	4	Start 3	137	3.6	105.5	5.87	0.93
Stimpy	G	N	A	4	Start 4	135	3.15	101.5	5.94	0.965
Tank	G	Y	B	1	Canter 1	143	4.4	105	5.445	0.875
Tank	G	Y	B	1	Canter 2	141.5	4	102.5	5.94	5.875
Tank	G	Y	B	1	Canter 3	144	4.4	105.5	5.33	0.91
Tank	G	Y	B	1	Canter 4	143.5	4.25	104.5	5.415	0.905
Tank	G	Y	B	1	End 1	141	3.4	104	5.725	0.88
Tank	G	Y	B	1	End 2	140.5	3.3	102	5.855	0.995
Tank	G	Y	B	1	End 3	143.5	3.45	105	5.51	0.97
Tank	G	Y	B	1	End 4	142	3.1	104.5	5.18	0.805
Tank	G	Y	B	1	Start 1	140	4.1	104.5	6.205	0.975

Horse	Fiber	Fat	Diet	Period	Time	Na (mmol/l)	K (mmol/l)	Cl (mmol/l)	Ca (mg/dl)	Mg (mg/dl)
Tank	G	Y	B	1	Start 2	139.5	3.3	104.5	6.105	0.91
Tank	G	Y	B	1	Start 3	141	3.9	104.5	3.405	1.04
Tank	G	Y	B	1	Start 4	140.5	3.25	105	5.785	0.885
Tank	M	N	C	2	Canter 1	141	4.6	102	6.045	0.93
Tank	M	N	C	2	Canter 2	142	4.15	102.5	5.615	0.785
Tank	M	N	C	2	Canter 3	142.5	4.55	102.5	6.08	0.87
Tank	M	N	C	2	Canter 4	143	4.2	102.5	5.455	0.78
Tank	M	N	C	2	End 1	139	3.15	103.5	5.615	0.87
Tank	M	N	C	2	End 2	139.5	3.1	102	5.625	0.77
Tank	M	N	C	2	End 3	140	3.35	100	6.015	0.87
Tank	M	N	C	2	End 4	140	3.2	102	5.6	0.845
Tank	M	N	C	2	Start 1	137.5	3.6	103	6.225	0.92
Tank	M	N	C	2	Start 2	138.5	3.1	101	6.37	1.01
Tank	M	N	C	2	Start 3	140.5	3.3	104	6.405	0.91
Tank	M	N	C	2	Start 4	139	3.2	100	6.43	0.915
Tank	G	N	A	3	Canter 1	139.5	4.65	104.5	5.545	0.8
Tank	G	N	A	3	Canter 2	140	4.4	102	5.88	0.905
Tank	G	N	A	3	Canter 3	138.5	4.6	104	5.755	0.9
Tank	G	N	A	3	Canter 4	140.5	4.1	104.5	5.07	0.78
Tank	G	N	A	3	End 1	137.5	3.5	105	5.465	0.81
Tank	G	N	A	3	End 2	138	3.35	101	5.96	0.915
Tank	G	N	A	3	End 3	137.5	3.5	102	5.88	0.905
Tank	G	N	A	3	End 4	138.5	3.05	102.5	5.23	0.795
Tank	G	N	A	3	Start 1	138	3.9	107	5.495	0.755
Tank	G	N	A	3	Start 2	136	3.7	102	6.305	1.025
Tank	G	N	A	3	Start 3	136.5	3.65	103.5	6.56	1
Tank	G	N	A	3	Start 4	136.5	3.35	101	6.085	0.89
Tank	M	Y	D	4	Canter 1	139.5	4.65	100.5	6.145	1.19
Tank	M	Y	D	4	Canter 2	141.5	4	100	6.23	1.155
Tank	M	Y	D	4	Canter 3	140	4.25	103	6.165	1.12
Tank	M	Y	D	4	Canter 4	141	4.15	51.05	6.125	1.13
Tank	M	Y	D	4	End 1	137	3.25	102	5.745	1.105
Tank	M	Y	D	4	End 2	137	2.9	99	6.32	1.245
Tank	M	Y	D	4	End 3	137	3.4	100	6.51	1.465
Tank	M	Y	D	4	End 4	138	3.1	100.5	6.25	1.175
Tank	M	Y	D	4	Start 1	137	3.6	104.5	6.235	1.16
Tank	M	Y	D	4	Start 2	136	3.2	100	6.47	1.26
Tank	M	Y	D	4	Start 3	138.5	3.25	102.5	6.715	1.215
Tank	M	Y	D	4	Start 4	136.5	3	101.5	6.78	0.735

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Goliath	M	N	C	1	Canter 1	90.5	1.1	16.5	10.45	35.2
Goliath	M	N	C	1	Canter 2	96.5	1.65	16	10.2	34.8
Goliath	M	N	C	1	Canter 3	105	0.9	18	9.9	34.45
Goliath	M	N	C	1	Canter 4	101.5	1.6	17	8.65	32.75
Goliath	M	N	C	1	End 1	97	0.6	16	7.65	32.25
Goliath	M	N	C	1	End 2	120	0.95	17	8	32.6
Goliath	M	N	C	1	End 3	57	0.55	17.5	6.1	30.25
Goliath	M	N	C	1	End 4	112.5	1.15	17.5	6.35	30.75
Goliath	M	N	C	1	Start 1	188.5	0.5	17	7.45	17.25
Goliath	M	N	C	1	Start 2	111.5	0.7	16	6.7	30.85
Goliath	M	N	C	1	Start 3	131.5	1	18	7.9	32.15
Goliath	M	N	C	1	Start 4	105	0.55	17.5	5.6	29.5
Goliath	G	N	A	2	Canter 1	135	2.55	15	11.8	36.55
Goliath	G	N	A	2	Canter 2	139	3.15	15.5	10.6	35.15
Goliath	G	N	A	2	Canter 3	146.5	2.45	17	11.25	36.3
Goliath	G	N	A	2	Canter 4	129	3.4	16	11.7	36.75
Goliath	G	N	A	2	End 1	137	1.8	15	9.8	34.5
Goliath	G	N	A	2	End 2	140	2	15	8.45	32.7
Goliath	G	N	A	2	End 3	143	1.65	16	8.3	32.55
Goliath	G	N	A	2	End 4	133.5	2.3	16	9.7	34.15
Goliath	G	N	A	2	Start 1	140	1.65	16	9.25	34.05
Goliath	G	N	A	2	Start 2	140.5	1.85	15.5	4.4	33.05
Goliath	G	N	A	2	Start 3	161.5	1.65	16.5	7.8	32.45
Goliath	G	N	A	2	Start 4	133.5	1.7	16	8.05	32.55
Goliath	M	Y	D	3	Canter 1	112	1.85	16.5	11.4	36.65
Goliath	M	Y	D	3	Canter 2	122	1.95	16.5	10.6	35.45
Goliath	M	Y	D	3	Canter 3	113	1.3	17.5	10.25	34.65
Goliath	M	Y	D	3	Canter 4	111	1.4	18.5	10.55	35.15
Goliath	M	Y	D	3	End 1	113	0.5	16	8.95	33.95
Goliath	M	Y	D	3	End 2	132.5	1.1	16.5	8.85	33.95
Goliath	M	Y	D	3	End 3	121.5	0.8	17.5	7.25	32.4
Goliath	M	Y	D	3	End 4	114	1.05	17.5	7.4	32.3
Goliath	M	Y	D	3	Start 1	140	0.35	16.5	8.4	33.05
Goliath	M	Y	D	3	Start 2	127	0.9	16.5	9.1	33.6
Goliath	M	Y	D	3	Start 3	131	1.25	18	8.3	33.05
Goliath	M	Y	D	3	Start 4	126.5	1.1	18	6.9	31.65
Goliath	G	Y	B	4	Canter 1	109	2.35	17	13.15	37.95
Goliath	G	Y	B	4	Canter 2	122	1.95	18	14.5	39.3
Goliath	G	Y	B	4	Canter 3	113.5	1.2	18.5	13.55	38
Goliath	G	Y	B	4	Canter 4	109	1.35	18	13.2	37.4
Goliath	G	Y	B	4	End 1	109	0.1	18	11.85	36.3
Goliath	G	Y	B	4	End 2	119	0.55	18	11.7	36.35
Goliath	G	Y	B	4	End 3	118.5	0	18.5	11	35.6
Goliath	G	Y	B	4	End 4					
Goliath	G	Y	B	4	Start 1	124.5	0.15	18	11.85	36.7
Goliath	G	Y	B	4	Start 2	111.5	0.4	17.5	10.6	35.2
Goliath	G	Y	B	4	Start 3	124.5	0.95	19	10.25	36.25
Goliath	G	Y	B	4	Start 4	117.5	0.7	19	9.45	33.95
Sassy	G	N	A	1	Canter 1	113.5	0.65	20.5	8.85	32.45

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Sassy	G	N	A	1	Canter 2	106.5	1.2	21	7.5	31.15
Sassy	G	N	A	1	Canter 3	117	0.55	21.5	7.5	31.2
Sassy	G	N	A	1	Canter 4	134.5	1.5	22	7.1	31
Sassy	G	N	A	1	End 1	129	0.4	20.5	6.6	30.6
Sassy	G	N	A	1	End 2	108	0.8	19.5	4.4	28.2
Sassy	G	N	A	1	End 3	123	0.3	21	5	29.25
Sassy	G	N	A	1	End 4	130	1.05	20	4.65	29
Sassy	G	N	A	1	Start 1	129	0.6	20.5	4.7	28.85
Sassy	G	N	A	1	Start 2	127.5	0.6	21	5.45	29
Sassy	G	N	A	1	Start 3	132.5	0.5	18.5	3.35	27.3
Sassy	G	N	A	1	Start 4	119.5	0.4	20	3.3	27.5
Sassy	M	Y	D	2	Canter 1	108	1.3	23	11.4	35.65
Sassy	M	Y	D	2	Canter 2	110	1.15	22	11.85	35.75
Sassy	M	Y	D	2	Canter 3	101.5	0.95	23	12	36.15
Sassy	M	Y	D	2	Canter 4	109	1.9	22.5	12.3	36.35
Sassy	M	Y	D	2	End 1	109.5	0.65	23	8.2	32.45
Sassy	M	Y	D	2	End 2	118	0.65	22.5	9.7	33.95
Sassy	M	Y	D	2	End 3	113.5	0.75	22.5	9.7	34
Sassy	M	Y	D	2	End 4	123	1.45	22.5	9.4	184.3
Sassy	M	Y	D	2	Start 1	168	0.5	22.5	8.4	32.95
Sassy	M	Y	D	2	Start 2	125.5	0.9	23.5	7.7	32.15
Sassy	M	Y	D	2	Start 3	146	1	24.5	7.8	32.5
Sassy	M	Y	D	2	Start 4	117.5	1.1	22.5	8.65	32.95
Sassy	G	Y	B	3	Canter 1	103.5	1.05	18.5	10.2	34.6
Sassy	G	Y	B	3	Canter 2	112	1.55	19	8.95	32.95
Sassy	G	Y	B	3	Canter 3	139	0.7	19.5	8.75	33.05
Sassy	G	Y	B	3	Canter 4	111.5	1.6	19.5	9.25	33.55
Sassy	G	Y	B	3	End 1	105.5	0.5	18	7.85	32.4
Sassy	G	Y	B	3	End 2	118	0.8	18.5	6.85	31.05
Sassy	G	Y	B	3	End 3	111.5	0.5	19.5	6.4	30.85
Sassy	G	Y	B	3	End 4	116	1.2	19	6.55	31.6
Sassy	G	Y	B	3	Start 1	117.5	0.3	19	7.55	32.15
Sassy	G	Y	B	3	Start 2	110	0.7	18.5	7.65	32.05
Sassy	G	Y	B	3	Start 3	139	1.25	21	6.95	32
Sassy	G	Y	B	3	Start 4	110.5	0.9	20	6.05	30.5
Sassy	M	N	C	4	Canter 1	94		21.5	9.05	34
Sassy	M	N	C	4	Canter 2	108.5		22.5	11	35.55
Sassy	M	N	C	4	Canter 3					
Sassy	M	N	C	4	Canter 4	98.5		23	8.9	33.25
Sassy	M	N	C	4	End 1	105.5		21	8.4	33.1
Sassy	M	N	C	4	End 2	112.5		21	8.75	33.65
Sassy	M	N	C	4	End 3	109		23	8.6	33.5
Sassy	M	N	C	4	End 4	104	0	23.5	6.65	31.2
Sassy	M	N	C	4	Start 1	142		21.5	5.75	28.25
Sassy	M	N	C	4	Start 2	111		20	8.1	32.35
Sassy	M	N	C	4	Start 3	129.5		23.5	6.75	31.6
Sassy	M	N	C	4	Start 4	108.5		22	4.8	26.35
Smagic	M	Y	D	1	Canter 1	129	1.1	13	11.45	34.8
Smagic	M	Y	D	1	Canter 2	129	1.05	13	10.15	33.85
Smagic	M	Y	D	1	Canter 3	127	0.95	14	10.5	34.45

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Smagic	M	Y	D	1	Canter 4	126.5	0.8	14.5	10.95	36.2
Smagic	M	Y	D	1	End 1	123	1.05	12	6.8	30.5
Smagic	M	Y	D	1	End 2	137.5	1.05	13	7.8	32.1
Smagic	M	Y	D	1	End 3	128	1.05	14.5	8.1	32.55
Smagic	M	Y	D	1	End 4	123.5	0.6	14	7.65	32.1
Smagic	M	Y	D	1	Start 1	123	0.6	13	10.3	34.5
Smagic	M	Y	D	1	Start 2	134.5	1.4	12	6.55	30.65
Smagic	M	Y	D	1	Start 3	152.5	1.2	14.5	9.55	33.6
Smagic	M	Y	D	1	Start 4	133.5	1.45	14.5	7.4	32.25
Smagic	G	Y	B	2	Canter 1	114	1.5	14	10.25	34.65
Smagic	G	Y	B	2	Canter 2	123.5	1.9	14	9.95	33.9
Smagic	G	Y	B	2	Canter 3	124.5	1.1	15	11.25	35.6
Smagic	G	Y	B	2	Canter 4	121.5	1.25	15.5	10.3	34.9
Smagic	G	Y	B	2	End 1	123.5	1.6	14	7.5	32.1
Smagic	G	Y	B	2	End 2	133	1.9	14.5	7.3	31.65
Smagic	G	Y	B	2	End 3	130	1	16	9.65	34.8
Smagic	G	Y	B	2	End 4	127.5	1.1	15.5	9.15	34.05
Smagic	G	Y	B	2	Start 1	118.5	1.35	14.5	8.95	33.7
Smagic	G	Y	B	2	Start 2	126.5	1.7	14	6.55	31.25
Smagic	G	Y	B	2	Start 3	134	1.7	15	7.95	175.7
Smagic	G	Y	B	2	Start 4	130.5	1.2	15	8.2	33.1
Smagic	G	N	A	3	Canter 1	98.5	0.75	14	10.2	34.4
Smagic	G	N	A	3	Canter 2	101	1.1	15.5	10.05	34.5
Smagic	G	N	A	3	Canter 3	108	0.3	16	11	36.8
Smagic	G	N	A	3	Canter 4	109.5	0.5	16	10.05	188.8
Smagic	G	N	A	3	End 1	105.5	1	15	7.55	32.45
Smagic	G	N	A	3	End 2	110	0.85	15	8.25	33
Smagic	G	N	A	3	End 3	112	0.4	16	8.1	33
Smagic	G	N	A	3	End 4	111.5	0.55	16.5	6.95	31.45
Smagic	G	N	A	3	Start 1	113	0.75	14	8.35	33.35
Smagic	G	N	A	3	Start 2	111	1.05	15	7.15	31.9
Smagic	G	N	A	3	Start 3	114.5	1.15	16	6.95	31.85
Smagic	G	N	A	3	Start 4	115.5	0.9	16	7.95	32.65
Smagic	M	N	C	4	Canter 1	94.5		17	10.25	35.4
Smagic	M	N	C	4	Canter 2	105.5		17	11.05	36.35
Smagic	M	N	C	4	Canter 3	104.5	0	17.5	9.6	34.65
Smagic	M	N	C	4	Canter 4	107	0	18	9.95	34.65
Smagic	M	N	C	4	End 1	98.5		16	8.35	33.55
Smagic	M	N	C	4	End 2	103.5	0	17	8.45	33.5
Smagic	M	N	C	4	End 3	110	0	17.5	8.4	33.45
Smagic	M	N	C	4	End 4	117	0	18	7.35	32.45
Smagic	M	N	C	4	Start 1	122		16	7.95	33
Smagic	M	N	C	4	Start 2	109		17	7.85	33
Smagic	M	N	C	4	Start 3	125	0	18	8.55	187.55
Smagic	M	N	C	4	Start 4	110.5	0	18	8.8	33.6
Starlet	G	N	A	1	Canter 1	107.5	1.2	12.5	10.7	34.7
Starlet	G	N	A	1	Canter 2	117	1.25	13.5	11.7	35.75
Starlet	G	N	A	1	Canter 3	110	1.1	13.5	9.45	33.55
Starlet	G	N	A	1	Canter 4	111	1.55	13	8.15	31.9
Starlet	G	N	A	1	End 1	109	1	13	8.95	33.05

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Starlet	G	N	A	1	End 2	116	6.05	14.5	8.8	33.15
Starlet	G	N	A	1	End 3	116.5	0.9	14.5	8.35	34.1
Starlet	G	N	A	1	End 4	108	1.2	13	4.6	28.4
Starlet	G	N	A	1	Start 1	136.5	0.95	13	7.7	32.1
Starlet	G	N	A	1	Start 2	113	1.1	14	8.5	33
Starlet	G	N	A	1	Start 3	138	1	13	6.3	30.85
Starlet	G	N	A	1	Start 4	112	0.85	13	5.7	29.9
Starlet	M	N	C	2	Canter 1	98	1.7	17	10.55	35.75
Starlet	M	N	C	2	Canter 2	112.5	1.85	17	11.5	35.4
Starlet	M	N	C	2	Canter 3	103.5	1	18	11	36.05
Starlet	M	N	C	2	Canter 4	112	1.2	17.5	10.6	34.95
Starlet	M	N	C	2	End 1	109	0	17	8.45	33.2
Starlet	M	N	C	2	End 2	113.5	0	17	9.85	34.6
Starlet	M	N	C	2	End 3	111.5	0	18	9	33.8
Starlet	M	N	C	2	End 4	120	0.5	18.5	8.3	32.6
Starlet	M	N	C	2	Start 1	151.5	0	18	9.65	34.75
Starlet	M	N	C	2	Start 2	126.5	0.25	17.5	7.4	32.25
Starlet	M	N	C	2	Start 3	156.5	0.25	18.5	8.05	32.95
Starlet	M	N	C	2	Start 4	121	0.9	18.5	6.8	31.45
Starlet	G	Y	B	3	Canter 1	108.5	2.7	15	8.85	33.2
Starlet	G	Y	B	3	Canter 2	118	3.55	17	11.95	36.65
Starlet	G	Y	B	3	Canter 3	112.5	1.95	16.5	11.3	35.95
Starlet	G	Y	B	3	Canter 4	114	1.95	17	10.75	35.05
Starlet	G	Y	B	3	End 1	107	1.75	15.5	8.45	32.95
Starlet	G	Y	B	3	End 2	116.5	2.1	15	9.4	33.8
Starlet	G	Y	B	3	End 3	114.5	1.2	16	8.5	33.1
Starlet	G	Y	B	3	End 4	117	1.4	16	8.6	32.9
Starlet	G	Y	B	3	Start 1	119	1	16	8.15	33.1
Starlet	G	Y	B	3	Start 2	109.5	1.8	16	7.75	177.65
Starlet	G	Y	B	3	Start 3	135	2	18	7.15	32.2
Starlet	G	Y	B	3	Start 4	114.5	1.6	16.5	8.5	33.5
Starlet	M	Y	D	4	Canter 1	98	1.75	19	11.55	36.65
Starlet	M	Y	D	4	Canter 2	107.5	1.9	18.5	11.65	36.5
Starlet	M	Y	D	4	Canter 3	99	0.65	19	10.7	35.3
Starlet	M	Y	D	4	Canter 4	96.5	1.7	19.5	9.35	34.2
Starlet	M	Y	D	4	End 1	103.5	0.85	19	9.65	34.5
Starlet	M	Y	D	4	End 2	113.5	0.5	19	9.75	34.7
Starlet	M	Y	D	4	End 3	109	0.75	19	6.65	31.35
Starlet	M	Y	D	4	End 4	115		19.5	7.45	32.2
Starlet	M	Y	D	4	Start 1	119.5	0.55	19	8.4	33.55
Starlet	M	Y	D	4	Start 2	109.5	1	19	9.5	34.35
Starlet	M	Y	D	4	Start 3	132.5	1	20	7.35	32.2
Starlet	M	Y	D	4	Start 4	102.5	1.1	19	5.55	30.15
Stimpy	M	Y	D	1	Canter 1	114	1.7	16.5	8.05	31.05
Stimpy	M	Y	D	1	Canter 2	116.5	1.7	17	1.75	18.4
Stimpy	M	Y	D	1	Canter 3	134.5	0.6	18.5	9.7	33.15
Stimpy	M	Y	D	1	Canter 4	112	1.05	18	8.45	31.9
Stimpy	M	Y	D	1	End 1	129	1.6	16	4.95	27.6
Stimpy	M	Y	D	1	End 2	127	10.55	16.5	3.7	25.25
Stimpy	M	Y	D	1	End 3	119	0.65	17	6.55	30.1

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Stimpy	M	Y	D	1	End 4	122.5	2.05	18	5.5	29.15
Stimpy	M	Y	D	1	Start 1	117.5	0	15.5	7.9	32.25
Stimpy	M	Y	D	1	Start 2	138	1.5	17	4.6	29
Stimpy	M	Y	D	1	Start 3	134.5	0.35	18	7	31.25
Stimpy	M	Y	D	1	Start 4	127.5	0.9	16.5	6	30.3
Stimpy	G	Y	B	2	Canter 1	113.5	3	16	10.9	34.2
Stimpy	G	Y	B	2	Canter 2	124.5	2.25	16.5	7.9	31.2
Stimpy	G	Y	B	2	Canter 3	118	1.65	19	10.2	33.8
Stimpy	G	Y	B	2	Canter 4	118.5	2.05	18.5	10.55	33.15
Stimpy	G	Y	B	2	End 1	118.5	3.1	15	7.75	31.2
Stimpy	G	Y	B	2	End 2	122	2.1	16.5	8.25	29.85
Stimpy	G	Y	B	2	End 3	119.5	1.9	19	8.05	31.65
Stimpy	G	Y	B	2	End 4	123	2.45	17.5	6.55	29.75
Stimpy	G	Y	B	2	Start 1	111	0.95	16	9.15	33.25
Stimpy	G	Y	B	2	Start 2	122	3	15	6.75	30.8
Stimpy	G	Y	B	2	Start 3	126.5	2.1	17	6.95	30.9
Stimpy	G	Y	B	2	Start 4	119	2	17.5	6.8	30.65
Stimpy	M	N	C	3	Canter 1	99	1.45	16.5	9.4	33.35
Stimpy	M	N	C	3	Canter 2	117.5	1.25	19	11.9	35.75
Stimpy	M	N	C	3	Canter 3	96	0.7	19	10.7	34.55
Stimpy	M	N	C	3	Canter 4	101.5	0.95	21	9.65	33.5
Stimpy	M	N	C	3	End 1	115	1.1	17.5	8.2	32.8
Stimpy	M	N	C	3	End 2	115	0.75	17.5	7.7	31.6
Stimpy	M	N	C	3	End 3	102.5	0.6	19	7.55	32
Stimpy	M	N	C	3	End 4	119	1.3	21.5	7.6	31.85
Stimpy	M	N	C	3	Start 1	103.5	0	17	9.4	34.35
Stimpy	M	N	C	3	Start 2	117.5	1.1	18	7.4	32.2
Stimpy	M	N	C	3	Start 3	132	1.05	19.5	7	31.55
Stimpy	M	N	C	3	Start 4	108	1	18.5	6.75	31.2
Stimpy	G	N	A	4	Canter 1	88	1.6	16.5	10.95	34.15
Stimpy	G	N	A	4	Canter 2	90.5	1.15	17	9.6	32.65
Stimpy	G	N	A	4	Canter 3	100.5	1.3	19	10	176.65
Stimpy	G	N	A	4	Canter 4	98.5	2.25	20	9.85	33.25
Stimpy	G	N	A	4	End 1	98	1.15	16	5.8	29.65
Stimpy	G	N	A	4	End 2	95.5	1.05	17.5	8.1	32.15
Stimpy	G	N	A	4	End 3	104	1.1	18	7.3	168.5
Stimpy	G	N	A	4	End 4	107.5	2.55	19.5	7.55	31.45
Stimpy	G	N	A	4	Start 1	107	0.3	16	7.9	32.1
Stimpy	G	N	A	4	Start 2	107	1.2	17	5.9	29.9
Stimpy	G	N	A	4	Start 3	104	1.45	17	3.95	25.15
Stimpy	G	N	A	4	Start 4	107.5	1.55	18.5	4.15	26.1
Tank	G	Y	B	1	Canter 1	123	1.95	13	8.4	33.1
Tank	G	Y	B	1	Canter 2	139.5	2.05	13.5	9.25	34.05
Tank	G	Y	B	1	Canter 3	128	1.35	13	9.05	33.6
Tank	G	Y	B	1	Canter 4	132	2.05	14	8.8	33.5
Tank	G	Y	B	1	End 1	132.5	1.15	14	5.95	30
Tank	G	Y	B	1	End 2	148	1.2	14	7.5	32.35
Tank	G	Y	B	1	End 3	134	0.75	13.5	7.45	32.05
Tank	G	Y	B	1	End 4	140	1.2	14	5.6	30.05
Tank	G	Y	B	1	Start 1	135.5	1.15	14.5	6.9	32.15

Horse	Fiber	Fat	Diet	Period	Time	glucose (mg/dl)	lactate (mmol/l)	BUN (mg/dl)	BE-B (mmol/l)	HCO3 (mmol/l)
Tank	G	Y	B	1	Start 2	139.5	1.1	14	5.45	30.35
Tank	G	Y	B	1	Start 3	153.5	1.15	14.5	6.75	31.85
Tank	G	Y	B	1	Start 4	133	0.8	14	4.65	29.45
Tank	M	N	C	2	Canter 1	125	4.35	16.5	9.4	35.8
Tank	M	N	C	2	Canter 2	120.5	1.25	15.5	11.05	35.9
Tank	M	N	C	2	Canter 3	109	1.25	16.5	12.5	37.25
Tank	M	N	C	2	Canter 4	118	1.4	16.5	12	36.2
Tank	M	N	C	2	End 1	126	1.65	16	8.3	33.65
Tank	M	N	C	2	End 2	126	0.65	15.5	9.15	33.95
Tank	M	N	C	2	End 3	120	0.9	17	9.45	34.45
Tank	M	N	C	2	End 4	133	1.2	17	9.4	34.05
Tank	M	N	C	2	Start 1	155	0.55	15	8.1	33.1
Tank	M	N	C	2	Start 2	131	1.35	17	8.15	33.8
Tank	M	N	C	2	Start 3	158.5	1.6	17	9.05	33.6
Tank	M	N	C	2	Start 4	121	1.25	17	9.05	34.05
Tank	G	N	A	3	Canter 1	102.5	1.35	16.5	11.8	36.15
Tank	G	N	A	3	Canter 2	110	1.8	17	12.4	37.2
Tank	G	N	A	3	Canter 3	110.5	1.15	17	11.45	35.55
Tank	G	N	A	3	Canter 4	112.5	1.3	18	12.15	36.75
Tank	G	N	A	3	End 1	102.5	0.75	14.5	8.05	30.6
Tank	G	N	A	3	End 2	114	0.85	17	10.1	34.95
Tank	G	N	A	3	End 3	116	0.8	17.5	8.9	33.4
Tank	G	N	A	3	End 4	118	0.95	17.5	9.05	33.6
Tank	G	N	A	3	Start 1	120	0.3	15	6.95	30.95
Tank	G	N	A	3	Start 2	113	0.65	16.5	9.3	33.75
Tank	G	N	A	3	Start 3	120	1.3	18.5	8.6	33.6
Tank	G	N	A	3	Start 4	113.5	1	17.5	7.7	32.25
Tank	M	Y	D	4	Canter 1	107.5	1.75	16.5	12.45	37.6
Tank	M	Y	D	4	Canter 2	118	1.3	17	11.15	36
Tank	M	Y	D	4	Canter 3	112	1.15	17	10.95	35.55
Tank	M	Y	D	4	Canter 4	105	1	18	11.15	35.8
Tank	M	Y	D	4	End 1	115.5	0.5	16	9.45	31.7
Tank	M	Y	D	4	End 2	127.5	0.6	17	9.4	34.45
Tank	M	Y	D	4	End 3	127	0.6	17.5	8.65	33.7
Tank	M	Y	D	4	End 4	115.5	0.8	18	9.1	34.1
Tank	M	Y	D	4	Start 1	123.5	0.25	16.5	6.5	29.05
Tank	M	Y	D	4	Start 2	118.5	0.4	16.5	10.7	35.65
Tank	M	Y	D	4	Start 3	130.5	1.2	18.5	8.25	33.45
Tank	M	Y	D	4	Start 4	116	1.5	18	6.3	31.2

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Goliath	M	N	C	1	Canter 1	5.555	0.815	8.1	285.5
Goliath	M	N	C	1	Canter 2	5.455	0.815	7.4	285.5
Goliath	M	N	C	1	Canter 3	6.26	0.96	9.15	285
Goliath	M	N	C	1	Canter 4	5.58	0.89	9.05	283.5
Goliath	M	N	C	1	End 1	5.345	0.75	8.2	282.5
Goliath	M	N	C	1	End 2	6.375	1.015	8	281
Goliath	M	N	C	1	End 3	5.65	0.835	8.15	278
Goliath	M	N	C	1	End 4	5.065	0.795	8.2	278.5
Goliath	M	N	C	1	Start 1	5.975	0.91	7.35	281.5
Goliath	M	N	C	1	Start 2	5.515	0.765	7.95	282
Goliath	M	N	C	1	Start 3	6.015	0.87	7.6	284.5
Goliath	M	N	C	1	Start 4	5.785	0.86	7.75	279
Goliath	G	N	A	2	Canter 1	6.04	0.755	6.15	283
Goliath	G	N	A	2	Canter 2	5.985	0.795	8.6	282
Goliath	G	N	A	2	Canter 3	6.65	1.015	11.45	283.5
Goliath	G	N	A	2	Canter 4	6.145	0.835	9.65	282.5
Goliath	G	N	A	2	End 1	6.37	0.835	5.4	276.5
Goliath	G	N	A	2	End 2	5.91	0.75	6	275
Goliath	G	N	A	2	End 3	5.975	0.77	8.6	278
Goliath	G	N	A	2	End 4	5.99	0.76	7.7	277
Goliath	G	N	A	2	Start 1	6.55	0.885	6.2	279.5
Goliath	G	N	A	2	Start 2	6.575	0.875	272.2	275.5
Goliath	G	N	A	2	Start 3	6.455	0.9	6.3	277
Goliath	G	N	A	2	Start 4	6.175	0.75	6.95	274.5
Goliath	M	Y	D	3	Canter 1	6.185	1.05	5.45	280
Goliath	M	Y	D	3	Canter 2	6.305	1.095	8.05	283
Goliath	M	Y	D	3	Canter 3	5.86	0.925	8	284
Goliath	M	Y	D	3	Canter 4	6.43	1.125	7.35	284
Goliath	M	Y	D	3	End 1	5.945	0.975	6.35	277
Goliath	M	Y	D	3	End 2	6.17	1.075	7	277
Goliath	M	Y	D	3	End 3	6.155	1.085	10.2	280
Goliath	M	Y	D	3	End 4	5.845	0.97	6.4	277.5
Goliath	M	Y	D	3	Start 1	5.78	0.915	4.95	280
Goliath	M	Y	D	3	Start 2	6.5	1.095	6.05	276
Goliath	M	Y	D	3	Start 3	6.75	1.16	5.35	279
Goliath	M	Y	D	3	Start 4	6.665	1.12	8.3	277.5
Goliath	G	Y	B	4	Canter 1	6.24	0.88	3.95	279
Goliath	G	Y	B	4	Canter 2	6.51	0.99	1.25	276
Goliath	G	Y	B	4	Canter 3	6.355	0.895	3.15	277.5
Goliath	G	Y	B	4	Canter 4	6.225	0.92	2.7	275
Goliath	G	Y	B	4	End 1	6.12	0.855	2.4	273
Goliath	G	Y	B	4	End 2	6.65	1.065	3.55	272
Goliath	G	Y	B	4	End 3	6.4	0.92	3.05	272
Goliath	G	Y	B	4	End 4				
Goliath	G	Y	B	4	Start 1	6.55	1.035	2.45	277.5
Goliath	G	Y	B	4	Start 2	6.59	0.915	2.45	271.5
Goliath	G	Y	B	4	Start 3	6.58	0.965	1.45	273.5
Goliath	G	Y	B	4	Start 4	6.655	1.02	3.35	269.5
Sassy	G	N	A	1	Canter 1	6.115	0.86	8.25	287

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Sassy	G	N	A	1	Canter 2	6.4	0.97	10.5	284
Sassy	G	N	A	1	Canter 3	6.255	0.925	11.85	288
Sassy	G	N	A	1	Canter 4	6.47	1.14	13	286
Sassy	G	N	A	1	End 1	6.38	0.93	9.45	284.5
Sassy	G	N	A	1	End 2	5.94	0.915	9.1	279.5
Sassy	G	N	A	1	End 3	5.985	0.885	10.9	285.5
Sassy	G	N	A	1	End 4	5.575	0.88	9.75	283
Sassy	G	N	A	1	Start 1	6.555	1.04	9.65	284
Sassy	G	N	A	1	Start 2	6.36	0.885	9.75	284
Sassy	G	N	A	1	Start 3	6.275	0.97	7.75	280.5
Sassy	G	N	A	1	Start 4	6.09	0.87	9.7	280.5
Sassy	M	Y	D	2	Canter 1	6.425	0.87	5.1	282
Sassy	M	Y	D	2	Canter 2	6.73	1.005	6.65	281.5
Sassy	M	Y	D	2	Canter 3	6.62	0.86	5.2	284
Sassy	M	Y	D	2	Canter 4	6.65	0.855	6.3	283.5
Sassy	M	Y	D	2	End 1	6.225	0.82	7.55	281
Sassy	M	Y	D	2	End 2	6.465	0.945	4.35	278.5
Sassy	M	Y	D	2	End 3	6.41	0.835	5.65	281
Sassy	M	Y	D	2	End 4	6.435	0.785	7.35	282.5
Sassy	M	Y	D	2	Start 1	6.17	0.855	4.3	282
Sassy	M	Y	D	2	Start 2	6.71	0.97	6.65	278.5
Sassy	M	Y	D	2	Start 3	6.94	0.995	7.5	286
Sassy	M	Y	D	2	Start 4	3.8	0.86	7.85	282
Sassy	G	Y	B	3	Canter 1	6.555	1.01	5.85	283.5
Sassy	G	Y	B	3	Canter 2	6.39	1.04	6.55	280.5
Sassy	G	Y	B	3	Canter 3	6.465	0.965	6.55	282.5
Sassy	G	Y	B	3	Canter 4	6.365	1.02	6.65	281
Sassy	G	Y	B	3	End 1	6.17	0.915	3.3	278
Sassy	G	Y	B	3	End 2	6.02	0.94	5.95	278
Sassy	G	Y	B	3	End 3	6.235	0.93	5.85	279
Sassy	G	Y	B	3	End 4	5.665	0.84	4.5	278
Sassy	G	Y	B	3	Start 1	6.495	1.015	5.35	282.5
Sassy	G	Y	B	3	Start 2	6.575	1.01	3.75	276
Sassy	G	Y	B	3	Start 3	7.185	1.23	5.15	282
Sassy	G	Y	B	3	Start 4	6.41	0.97	6.55	277.5
Sassy	M	N	C	4	Canter 1	6.38	1.055	7.05	287
Sassy	M	N	C	4	Canter 2	6.825	1.19	5.95	284.5
Sassy	M	N	C	4	Canter 3				
Sassy	M	N	C	4	Canter 4	6.43	1.055	11	288.5
Sassy	M	N	C	4	End 1	6.41	1.205	3.6	278.5
Sassy	M	N	C	4	End 2	6.415	1.075	2.65	279
Sassy	M	N	C	4	End 3	6.57	1	5.8	284.5
Sassy	M	N	C	4	End 4	5.95	0.82	7.2	283.5
Sassy	M	N	C	4	Start 1	6.73	1.14	6.65	286.5
Sassy	M	N	C	4	Start 2	6.575	1.16	2.05	277
Sassy	M	N	C	4	Start 3	6.835	1.12	6.75	286
Sassy	M	N	C	4	Start 4	6.96	1.075	5.7	277
Smagic	M	Y	D	1	Canter 1	6.38	0.94	6.9	281.5
Smagic	M	Y	D	1	Canter 2	5.79	0.845	8.5	284
Smagic	M	Y	D	1	Canter 3	6.925	1.13	9.05	283

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Smagic	M	Y	D	1	Canter 4	6.46	1.08	6.75	282
Smagic	M	Y	D	1	End 1	4.895	0.6	6.5	280.5
Smagic	M	Y	D	1	End 2	6.005	0.895	9.75	281.5
Smagic	M	Y	D	1	End 3	6.475	1.07	9.1	282
Smagic	M	Y	D	1	End 4	5.81	0.845	7.6	280.5
Smagic	M	Y	D	1	Start 1	5.84	0.74	5.2	280
Smagic	M	Y	D	1	Start 2	5.49	0.73	7.15	281.5
Smagic	M	Y	D	1	Start 3	6.75	1.075	6.95	284
Smagic	M	Y	D	1	Start 4	6.59	1.1	7.3	280.5
Smagic	G	Y	B	2	Canter 1	5.805	0.665	7.1	282
Smagic	G	Y	B	2	Canter 2	6.05	0.85	8.15	280
Smagic	G	Y	B	2	Canter 3	6.625	0.99	9.1	283.5
Smagic	G	Y	B	2	Canter 4	5.96	0.855	10.25	286.5
Smagic	G	Y	B	2	End 1	6.435	0.875	8.7	278.5
Smagic	G	Y	B	2	End 2	6.16	0.895	9.1	278.5
Smagic	G	Y	B	2	End 3	6.475	0.975	4.9	279.5
Smagic	G	Y	B	2	End 4	6.15	0.87	6.6	281
Smagic	G	Y	B	2	Start 1	6.09	0.75	6.85	281
Smagic	G	Y	B	2	Start 2	5.03	0.92	10.25	277.5
Smagic	G	Y	B	2	Start 3	6.435	0.935	8.25	283
Smagic	G	Y	B	2	Start 4	6.49	0.93	7.25	280.5
Smagic	G	N	A	3	Canter 1	5.97	0.895	4.85	279.5
Smagic	G	N	A	3	Canter 2	5.74	0.9	7.55	284
Smagic	G	N	A	3	Canter 3	6.45	1	6.6	281
Smagic	G	N	A	3	Canter 4	5.895	0.895	6	281.5
Smagic	G	N	A	3	End 1	6.17	0.925	6.9	277.5
Smagic	G	N	A	3	End 2	5.835	0.895	6.2	279
Smagic	G	N	A	3	End 3	6.035	0.915	5.25	279
Smagic	G	N	A	3	End 4	5.575	0.77	8.75	281.5
Smagic	G	N	A	3	Start 1	5.955	0.88	6.3	281.5
Smagic	G	N	A	3	Start 2	6.46	1.005	8.1	277.5
Smagic	G	N	A	3	Start 3	6.295	0.95	8.55	281
Smagic	G	N	A	3	Start 4	6.24	0.955	6.85	280
Smagic	M	N	C	4	Canter 1	5.95	0.905	7.45	290
Smagic	M	N	C	4	Canter 2	6.7	1.29	9.1	287.5
Smagic	M	N	C	4	Canter 3	6.56	1.055	10.75	294.5
Smagic	M	N	C	4	Canter 4	6.18	1.035	7.4	287
Smagic	M	N	C	4	End 1	5.9	0.92	5.6	283
Smagic	M	N	C	4	End 2	5.965	0.95	6.65	286
Smagic	M	N	C	4	End 3	6.175	0.935	6.75	286
Smagic	M	N	C	4	End 4	6	0.905	6.15	285
Smagic	M	N	C	4	Start 1	6.075	0.88	5.15	285.5
Smagic	M	N	C	4	Start 2	6.32	1.02	5.75	283
Smagic	M	N	C	4	Start 3	6.51	1.105	6.75	290
Smagic	M	N	C	4	Start 4	6.21	0.975	7.55	286.5
Starlet	G	N	A	1	Canter 1	6.225	0.96	5.8	283
Starlet	G	N	A	1	Canter 2	6.175	0.965	9.95	285.5
Starlet	G	N	A	1	Canter 3	6.295	0.945	9	286
Starlet	G	N	A	1	Canter 4	5.61	0.83	9.75	282.5
Starlet	G	N	A	1	End 1	6.095	0.86	5	282

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Starlet	G	N	A	1	End 2	5.825	0.88	10.95	284
Starlet	G	N	A	1	End 3	6.34	0.96	6.4	280.5
Starlet	G	N	A	1	End 4	4.345	0.52	8.5	282
Starlet	G	N	A	1	Start 1	6.475	1.025	5.75	280.5
Starlet	G	N	A	1	Start 2	6.715	1.02	6.5	279.5
Starlet	G	N	A	1	Start 3	6.185	0.925	5.8	284
Starlet	G	N	A	1	Start 4	5.56	0.71	7.8	279.5
Starlet	M	N	C	2	Canter 1	6.565	0.99	7.95	284.5
Starlet	M	N	C	2	Canter 2	6.64	1.02	10.1	286.5
Starlet	M	N	C	2	Canter 3	6.62	0.985	9.4	288.5
Starlet	M	N	C	2	Canter 4	6.41	0.91	9.35	286
Starlet	M	N	C	2	End 1	6.6	0.98	8.3	282
Starlet	M	N	C	2	End 2	6.505	1.065	6.95	282
Starlet	M	N	C	2	End 3	6.5	0.95	8	284
Starlet	M	N	C	2	End 4	6.35	0.91	8	282
Starlet	M	N	C	2	Start 1	6.805	1.1	3.9	281.5
Starlet	M	N	C	2	Start 2	7.075	1.095	7.7	281
Starlet	M	N	C	2	Start 3	6.82	1.07	7.1	287
Starlet	M	N	C	2	Start 4	6.765	0.97	7.2	280
Starlet	G	Y	B	3	Canter 1	5.91	0.935	8.1	282.5
Starlet	G	Y	B	3	Canter 2	6.06	1.035	8.25	288
Starlet	G	Y	B	3	Canter 3	6.235	1.075	8.85	289
Starlet	G	Y	B	3	Canter 4	6.275	1.045	8.6	285.5
Starlet	G	Y	B	3	End 1	6.135	0.995	5.45	279.5
Starlet	G	Y	B	3	End 2	5.665	0.945	7.5	282.5
Starlet	G	Y	B	3	End 3	6.015	0.97	7.75	284
Starlet	G	Y	B	3	End 4	6.085	1.015	7.1	280
Starlet	G	Y	B	3	Start 1	6.33	1.04	5.7	283
Starlet	G	Y	B	3	Start 2	6.52	1.075	6.95	278.5
Starlet	G	Y	B	3	Start 3	6.69	1.215	9.15	287.5
Starlet	G	Y	B	3	Start 4	6.415	1.06	5.95	279
Starlet	M	Y	D	4	Canter 1	6.075	0.88	6.15	288.5
Starlet	M	Y	D	4	Canter 2	6.31	0.99	6.9	289
Starlet	M	Y	D	4	Canter 3	6.29	1.065	6.1	289
Starlet	M	Y	D	4	Canter 4	6.305	1.095	8.2	288
Starlet	M	Y	D	4	End 1	6.145	0.895	6.8	285.5
Starlet	M	Y	D	4	End 2	6.28	0.995	6.15	284.5
Starlet	M	Y	D	4	End 3	6.055	0.835	5.05	283
Starlet	M	Y	D	4	End 4	6.155	0.91	7.95	287.5
Starlet	M	Y	D	4	Start 1	6.3	1.105	6.05	282.5
Starlet	M	Y	D	4	Start 2	6.39	0.895	5.7	286.5
Starlet	M	Y	D	4	Start 3	6.445	1.12	6.7	290.5
Starlet	M	Y	D	4	Start 4	5.905	0.765	6.85	286.5
Stimpy	M	Y	D	1	Canter 1	6.215	0.935	9.45	283.5
Stimpy	M	Y	D	1	Canter 2	6.215	0.85	16.45	281
Stimpy	M	Y	D	1	Canter 3	6	0.88	9.5	288
Stimpy	M	Y	D	1	Canter 4	5.77	0.835	11.1	286.5
Stimpy	M	Y	D	1	End 1	6.51	1	10.8	279
Stimpy	M	Y	D	1	End 2	5.945	0.835	12.1	282.5
Stimpy	M	Y	D	1	End 3	5.405	0.745	10.1	286

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Stimpy	M	Y	D	1	End 4	5.59	0.815	10.75	283
Stimpy	M	Y	D	1	Start 1	5.83	0.83	6.2	283.5
Stimpy	M	Y	D	1	Start 2	6.525	1	11.75	283
Stimpy	M	Y	D	1	Start 3	6.41	0.92	9.95	287
Stimpy	M	Y	D	1	Start 4	6.175	0.865	9.15	281.5
Stimpy	G	Y	B	2	Canter 1	6.085	0.74	7.05	285.5
Stimpy	G	Y	B	2	Canter 2	5.85	0.74	5.8	283.5
Stimpy	G	Y	B	2	Canter 3	6.52	1.015	9.85	287
Stimpy	G	Y	B	2	Canter 4	6.05	0.885	7.75	284
Stimpy	G	Y	B	2	End 1	5.77	0.665	7.6	283
Stimpy	G	Y	B	2	End 2	5.685	0.705	4.95	284
Stimpy	G	Y	B	2	End 3	6.195	0.88	7.2	282.5
Stimpy	G	Y	B	2	End 4	5.27	0.665	8.35	282.5
Stimpy	G	Y	B	2	Start 1	6.17	0.405	5.6	284
Stimpy	G	Y	B	2	Start 2	6.345	0.785	6.1	278.5
Stimpy	G	Y	B	2	Start 3	5.82	0.845	7.25	284.5
Stimpy	G	Y	B	2	Start 4	6.015	0.815	7.05	280
Stimpy	M	N	C	3	Canter 1	5.89	0.8	7.3	282
Stimpy	M	N	C	3	Canter 2	6.72	1.125	4	280
Stimpy	M	N	C	3	Canter 3	6.02	0.88	6.8	286
Stimpy	M	N	C	3	Canter 4	5.78	0.875	6.65	287
Stimpy	M	N	C	3	End 1	6.25	0.94	6.6	279
Stimpy	M	N	C	3	End 2	5.35	0.7	4.05	279
Stimpy	M	N	C	3	End 3	5.72	0.84	6.7	282.5
Stimpy	M	N	C	3	End 4	6.03	0.965	6.85	284
Stimpy	M	N	C	3	Start 1	5.96	0.895	3.7	279.5
Stimpy	M	N	C	3	Start 2	6.47	0.97	8.2	279.5
Stimpy	M	N	C	3	Start 3	6.245	0.92	7.05	285.5
Stimpy	M	N	C	3	Start 4	5.935	0.85	5.65	279
Stimpy	G	N	A	4	Canter 1	6.055	0.965	6.4	282
Stimpy	G	N	A	4	Canter 2	6.11	1.01	8.15	283
Stimpy	G	N	A	4	Canter 3	6.27	1.06	11.35	279.5
Stimpy	G	N	A	4	Canter 4	5.625	0.985	11	284
Stimpy	G	N	A	4	End 1	5.855	0.815	6.4	278
Stimpy	G	N	A	4	End 2	6.02	0.955	7.05	277
Stimpy	G	N	A	4	End 3	5.565	0.88	9.5	277
Stimpy	G	N	A	4	End 4	5.39	0.905	9.55	279.5
Stimpy	G	N	A	4	Start 1	6.05	0.985	5.3	281.5
Stimpy	G	N	A	4	Start 2	6.265	0.99	7.05	279
Stimpy	G	N	A	4	Start 3	6.41	0.975	10.4	276.5
Stimpy	G	N	A	4	Start 4	6.37	1	10.3	273
Tank	G	Y	B	1	Canter 1	5.57	0.885	9.4	287
Tank	G	Y	B	1	Canter 2	6.09	1.07	8.75	285
Tank	G	Y	B	1	Canter 3	5.49	0.92	9	288
Tank	G	Y	B	1	Canter 4	5.56	0.92	9.8	288.5
Tank	G	Y	B	1	End 1	5.78	0.885	9.7	283.5
Tank	G	Y	B	1	End 2	5.93	1.005	9	283.5
Tank	G	Y	B	1	End 3	5.62	0.98	8.25	285
Tank	G	Y	B	1	End 4	5.25	0.815	10.65	286
Tank	G	Y	B	1	Start 1	6.195	0.975	7.6	282.5

Horse	Fiber	Fat	Diet	Period	Time	nCa (mg/dl)	nMg (mg/dl)	An gap (mmol/l)	osmolality (mOsm/kg)
Tank	G	Y	B	1	Start 2	6.12	0.91	8.45	282
Tank	G	Y	B	1	Start 3	6.42	1.045	8.3	285
Tank	G	Y	B	1	Start 4	5.795	0.885	9.05	282
Tank	M	N	C	2	Canter 1	5.99	0.925	8.25	285
Tank	M	N	C	2	Canter 2	5.79	0.8	8.05	285.5
Tank	M	N	C	2	Canter 3	6.325	0.89	7.45	286
Tank	M	N	C	2	Canter 4	5.725	0.8	8.35	287
Tank	M	N	C	2	End 1	5.645	0.785	4.7	280
Tank	M	N	C	2	End 2	5.74	0.775	6.8	281.5
Tank	M	N	C	2	End 3	6.13	0.875	9.1	282.5
Tank	M	N	C	2	End 4	5.75	0.855	7.35	283
Tank	M	N	C	2	Start 1	6.265	0.925	4.9	279
Tank	M	N	C	2	Start 2	6.325	1.01	6.6	279.5
Tank	M	N	C	2	Start 3	6.435	0.915	6	284.5
Tank	M	N	C	2	Start 4	6.53	0.925	8.6	281
Tank	G	N	A	3	Canter 1	5.795	0.82	3.2	279.5
Tank	G	N	A	3	Canter 2	6.12	0.925	5	281.5
Tank	G	N	A	3	Canter 3	6.035	0.925	3.4	279
Tank	G	N	A	3	Canter 4	5.355	0.805	4.15	283
Tank	G	N	A	3	End 1	5.85	0.84	5.7	276
Tank	G	N	A	3	End 2	6.115	0.925	5.4	277.5
Tank	G	N	A	3	End 3	6.04	0.915	5.65	277
Tank	G	N	A	3	End 4	5.375	0.805	5.7	280
Tank	G	N	A	3	Start 1	5.66	0.77	3.8	278
Tank	G	N	A	3	Start 2	6.495	1.035	4.2	274.5
Tank	G	N	A	3	Start 3	6.64	1.005	3.45	276.5
Tank	G	N	A	3	Start 4	6.195	0.9	6.6	275.5
Tank	M	Y	D	4	Canter 1	6.325	1.215	6	280.5
Tank	M	Y	D	4	Canter 2	6.415	1.175	9.2	284
Tank	M	Y	D	4	Canter 3	6.4	1.145	6.3	282
Tank	M	Y	D	4	Canter 4	6.35	1.15	8.1	283
Tank	M	Y	D	4	End 1	6.225	1.155	6.4	276
Tank	M	Y	D	4	End 2	6.425	1.26	6.8	277
Tank	M	Y	D	4	End 3	6.605	1.475	6.45	277
Tank	M	Y	D	4	End 4	6.355	1.185	6.45	278.5
Tank	M	Y	D	4	Start 1	6.64	1.2	6.65	276
Tank	M	Y	D	4	Start 2	6.59	1.27	3.6	274.5
Tank	M	Y	D	4	Start 3	6.73	1.215	5.75	280
Tank	M	Y	D	4	Start 4	6.815	0.74	7	276

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Starlet	A	1	start 1	43.4	36.54
Starlet	A	1	B1 T2	106.3	36.94
Starlet	A	1	B1 C2	142.4	37.46
Starlet	A	1	B1 T5	102.4	37.02
Starlet	A	1	B1 C4	138.5	37.55
Starlet	A	1	End B1	44.1	36.55
Starlet	A	1	Start 2	43.1	36.73
Starlet	A	1	B2 T2	108.8	37.04
Starlet	A	1	B2 C2	140.2	37.49
Starlet	A	1	B2 T5	90	37.33
Starlet	A	1	B2 C4	134.5	37.55
Starlet	A	1	End B2	76.5	36.95
Starlet	A	1	Start B3	42.7	36.64
Starlet	A	1	B3 T2	109.7	37.52
Starlet	A	1	B3 C2	144	37.9
Starlet	A	1	B3 T5	108	37.44
Starlet	A	1	B3 C4	141.3	37.98
Starlet	A	1	End B3	81.4	37.16
Starlet	A	1	Start B4	44.9	36.55
Starlet	A	1	B4 T2	106.3	37.35
Starlet	A	1	B4 C2	128.4	37.82
Starlet	A	1	B4 T5	102.4	37.36
Starlet	A	1	B4 C4	132	37.8
Starlet	A	1	End B4	78	37.27
Starlet	C	2	start 1	46.7	36.6
Starlet	C	2	B1 T2	100.4	37.12
Starlet	C	2	B1 C2	134.2	37.39
Starlet	C	2	B1 T5	100	36.87
Starlet	C	2	B1 C4	136.4	37.44
Starlet	C	2	End B1	53.2	36.75
Starlet	C	2	Start 2	42.7	37.12
Starlet	C	2	B2 T2	102	37.55
Starlet	C	2	B2 C2	138	38.11
Starlet	C	2	B2 T5	105.4	37.61
Starlet	C	2	B2 C4	145.2	38.3
Starlet	C	2	End B2	81.3	37.39
Starlet	C	2	Start B3	45.4	36.7
Starlet	C	2	B3 T2	108	37.38
Starlet	C	2	B3 C2	142.2	37.95
Starlet	C	2	B3 T5	108	37.45
Starlet	C	2	B3 C4	139.2	37.98
Starlet	C	2	End B3		
Starlet	C	2	Start B4	49.4	36.82
Starlet	C	2	B4 T2	108.9	37.48
Starlet	C	2	B4 C2	138	38
Starlet	C	2	B4 T5	108	37.4
Starlet	C	2	B4 C4	136.8	37.94

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Starlet	C	2	End B4	80.2	37.96
Starlet	B	3	start 1	40.2	36.56
Starlet	B	3	B1 T2	96.8	36.87
Starlet	B	3	B1 C2	126.6	37.53
Starlet	B	3	B1 T5	102.9	37.01
Starlet	B	3	B1 C4	135.8	37.6
Starlet	B	3	End B1	78	36.79
Starlet	B	3	Start 2	92.2	36.7
Starlet	B	3	B2 T2	102	37.18
Starlet	B	3	B2 C2	139.2	37.75
Starlet	B	3	B2 T5	108	37.21
Starlet	B	3	B2 C4	135.8	37.83
Starlet	B	3	End B2	66.9	36.88
Starlet	B	3	Start B3	37.02	36.6
Starlet	B	3	B3 T2	105.2	37.08
Starlet	B	3	B3 C2		37.97
Starlet	B	3	B3 T5	106.3	37.44
Starlet	B	3	B3 C4	134.7	38.11
Starlet	B	3	End B3	69.1	37.2
Starlet	B	3	Start B4	46.4	36.5
Starlet	B	3	B4 T2	108.9	37.31
Starlet	B	3	B4 C2	136.4	37.94
Starlet	B	3	B4 T5	103.6	37.38
Starlet	B	3	B4 C4	132	38.03
Starlet	B	3	End B4	80.7	37.3
Starlet	D	4	start 1	47.6	36.5
Starlet	D	4	B1 T2	106.7	36.94
Starlet	D	4	B1 C2	144.6	37.49
Starlet	D	4	B1 T5	106.7	36.85
Starlet	D	4	B1 C4	142.8	37.37
Starlet	D	4	End B1	83.1	36.64
Starlet	D	4	Start 2	56.3	36.46
Starlet	D	4	B2 T2	104.6	36.94
Starlet	D	4	B2 C2	144.6	37.57
Starlet	D	4	B2 T5	108.9	37.08
Starlet	D	4	B2 C4	142.8	37.72
Starlet	D	4	End B2	80.3	36.79
Starlet	D	4	Start B3	39.1	36.58
Starlet	D	4	B3 T2	114	37.09
Starlet	D	4	B3 C2	132	37.75
Starlet	D	4	B3 T5	96	37.24
Starlet	D	4	B3 C4		37.86
Starlet	D	4	End B3	80.3	37.1
Starlet	D	4	Start B4	59.1	36.86
Starlet	D	4	B4 T2	108.4	37.3
Starlet	D	4	B4 C2	141.6	37.9
Starlet	D	4	B4 T5	104.1	37.46
Starlet	D	4	B4 C4	132	37.99

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Starlet	D	4	End B4	85.9	37.2
Goliath	C	1	start 1	40.3	36.35
Goliath	C	1	B1 T2	115.8	36.87
Goliath	C	1	B1 C2	153	37.72
Goliath	C	1	B1 T5	90	37.04
Goliath	C	1	B1 C4	157.8	37.84
Goliath	C	1	End B1	66.5	36.81
Goliath	C	1	Start 2	46.6	36.75
Goliath	C	1	B2 T2	116.3	36.87
Goliath	C	1	B2 C2	148.8	37.69
Goliath	C	1	B2 T5	117	36.99
Goliath	C	1	B2 C4	150	37.79
Goliath	C	1	End B2	83.6	36.82
Goliath	C	1	Start B3	47.25	36.76
Goliath	C	1	B3 T2	114	37
Goliath	C	1	B3 C2	147.6	37.83
Goliath	C	1	B3 T5	119	37.02
Goliath	C	1	B3 C4	151.2	37.82
Goliath	C	1	End B3	95.3	37.3
Goliath	C	1	Start B4	48	36.69
Goliath	C	1	B4 T2	110.3	37.07
Goliath	C	1	B4 C2	140.4	37.8
Goliath	C	1	B4 T5	97.6	37.18
Goliath	C	1	B4 C4	134	37.97
Goliath	C	1	End B4	96.3	37.15
Goliath	A	2	start 1	44.7	36.65
Goliath	A	2	B1 T2	102	36.79
Goliath	A	2	B1 C2	147.8	37.54
Goliath	A	2	B1 T5	114	37.43
Goliath	A	2	B1 C4	152.5	38.07
Goliath	A	2	End B1	85	37.18
Goliath	A	2	Start 2	50.1	36.93
Goliath	A	2	B2 T2	117.5	36.74
Goliath	A	2	B2 C2	150	37.56
Goliath	A	2	B2 T5	123.5	37.27
Goliath	A	2	B2 C4	156	37.93
Goliath	A	2	End B2	79.4	36.6
Goliath	A	2	Start B3	58.4	36.2
Goliath	A	2	B3 T2	120	37.04
Goliath	A	2	B3 C2	157.8	38.04
Goliath	A	2	B3 T5	121.5	37.32
Goliath	A	2	B3 C4	156.6	38.25
Goliath	A	2	End B3	94.13	37.48
Goliath	A	2	Start B4	55.3	37.02
Goliath	A	2	B4 T2	117.2	37.55
Goliath	A	2	B4 C2	144.6	38.25
Goliath	A	2	B4 T5	114	37.46
Goliath	A	2	B4 C4	149.4	38.3

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Goliath	A	2	End B4	97.98	37.23
Goliath	D	3	start 1	51.4	36.54
Goliath	D	3	B1 T2	107.1	36.8
Goliath	D	3	B1 C2	146.4	37.55
Goliath	D	3	B1 T5		36.75
Goliath	D	3	B1 C4		37.37
Goliath	D	3	End B1	72	36.41
Goliath	D	3	Start 2	51.3	36.66
Goliath	D	3	B2 T2	115.4	36.95
Goliath	D	3	B2 C2	141.6	37.9
Goliath	D	3	B2 T5		36.76
Goliath	D	3	B2 C4		37.63
Goliath	D	3	End B2	80.8	36.84
Goliath	D	3	Start B3	99.8	36.58
Goliath	D	3	B3 T2	117.7	37.12
Goliath	D	3	B3 C2	147	37.84
Goliath	D	3	B3 T5	91.4	37.08
Goliath	D	3	B3 C4	111.2	
Goliath	D	3	End B3	93.4	37.15
Goliath	D	3	Start B4	58.7	37.05
Goliath	D	3	B4 T2		37.21
Goliath	D	3	B4 C2		37.98
Goliath	D	3	B4 T5	112.7	37.04
Goliath	D	3	B4 C4		37.51
Goliath	D	3	End B4	57.5	37.3
Goliath	B	4	start 1	39.2	36.48
Goliath	B	4	B1 T2	110.3	36.74
Goliath	B	4	B1 C2	152.4	37.6
Goliath	B	4	B1 T5		36.72
Goliath	B	4	B1 C4		37.67
Goliath	B	4	End B1	86.8	36.62
Goliath	B	4	Start 2	47.4	36.54
Goliath	B	4	B2 T2	114.5	36.82
Goliath	B	4	B2 C2	154.2	37.66
Goliath	B	4	B2 T5	120	37.01
Goliath	B	4	B2 C4	148.8	37.98
Goliath	B	4	End B2	46.5	37.01
Goliath	B	4	Start B3	43.9	36.73
Goliath	B	4	B3 T2	116.3	37.14
Goliath	B	4	B3 C2	147	38.02
Goliath	B	4	B3 T5	116.1	37.43
Goliath	B	4	B3 C4	148.8	38.09
Goliath	B	4	End B3	95.6	37.32
Goliath	B	4	Start B4	47.4	36.91
Goliath	B	4	B4 T2	114.9	37.33
Goliath	B	4	B4 C2	142.9	38.33
Goliath	B	4	B4 T5	118.6	37.67
Goliath	B	4	B4 C4	144	38.39

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Goliath	B	4	End B4	92.6	37.52
Smagic	D	1	start 1	43.78	36.31
Smagic	D	1	B1 T2	102.8	37.08
Smagic	D	1	B1 C2	132	37.51
Smagic	D	1	B1 T5	99.3	36.97
Smagic	D	1	B1 C4	132	37.44
Smagic	D	1	End B1	75	36.87
Smagic	D	1	Start 2	44.7	36.74
Smagic	D	1	B2 T2	93.1	37.11
Smagic	D	1	B2 C2	133	37.51
Smagic	D	1	B2 T5	99.1	36.9
Smagic	D	1	B2 C4	130.9	37.4
Smagic	D	1	End B2	72	37.1
Smagic	D	1	Start B3	55.4	36.41
Smagic	D	1	B3 T2	96	36.87
Smagic	D	1	B3 C2	133.1	37.33
Smagic	D	1	B3 T5	96	
Smagic	D	1	B3 C4	132	
Smagic	D	1	End B3	66.9	
Smagic	D	1	Start B4		
Smagic	D	1	B4 T2	87.3	
Smagic	D	1	B4 C2	147	
Smagic	D	1	B4 T5	95.2	
Smagic	D	1	B4 C4		
Smagic	D	1	End B4	54	
Smagic	B	2	start 1	60.8	36.7
Smagic	B	2	B1 T2	98.4	37.07
Smagic	B	2	B1 C2	130.4	37.67
Smagic	B	2	B1 T5	101.25	37.08
Smagic	B	2	B1 C4	137.4	37.65
Smagic	B	2	End B1		36.78
Smagic	B	2	Start 2	44.1	36.77
Smagic	B	2	B2 T2	100.9	37.1
Smagic	B	2	B2 C2	132	37.64
Smagic	B	2	B2 T5	102	37.23
Smagic	B	2	B2 C4	132	37.63
Smagic	B	2	End B2	75.6	36.91
Smagic	B	2	Start B3	60.3	36.33
Smagic	B	2	B3 T2	97.9	37.3
Smagic	B	2	B3 C2		37.64
Smagic	B	2	B3 T5	99.9	37.27
Smagic	B	2	B3 C4	129	37.68
Smagic	B	2	End B3	73.1	36.97
Smagic	B	2	Start B4	51	36.9
Smagic	B	2	B4 T2	96	37.22
Smagic	B	2	B4 C2	126	37.57
Smagic	B	2	B4 T5	97.9	37.13
Smagic	B	2	B4 C4	125.45	37.59

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Smagic	B	2	End B4	63.65	37.04
Smagic	A	3	start 1	43.6	36.48
Smagic	A	3	B1 T2	100.5	37.02
Smagic	A	3	B1 C2	150	38
Smagic	A	3	B1 T5	102	37.03
Smagic	A	3	B1 C4	129.5	
Smagic	A	3	End B1	75.5	36.51
Smagic	A	3	Start 2	71	36.52
Smagic	A	3	B2 T2		36.81
Smagic	A	3	B2 C2		37.6
Smagic	A	3	B2 T5		37.11
Smagic	A	3	B2 C4		37.49
Smagic	A	3	End B2	73.2	36.98
Smagic	A	3	Start B3	79.3	36.39
Smagic	A	3	B3 T2		36.97
Smagic	A	3	B3 C2		37.53
Smagic	A	3	B3 T5		37.16
Smagic	A	3	B3 C4		37.71
Smagic	A	3	End B3	74.3	37.07
Smagic	A	3	Start B4	96	37.06
Smagic	A	3	B4 T2	90.75	37.29
Smagic	A	3	B4 C2	108	37.85
Smagic	A	3	B4 T5	100.3	37.37
Smagic	A	3	B4 C4	125.5	37.84
Smagic	A	3	End B4	75	37.64
Smagic	C	4	start 1	46.9	37.5
Smagic	C	4	B1 T2	113.1	36.92
Smagic	C	4	B1 C2	139.6	37.39
Smagic	C	4	B1 T5	91.9	36.58
Smagic	C	4	B1 C4	146.4	37.18
Smagic	C	4	End B1	93.4	36.73
Smagic	C	4	Start 2	117.5	36.57
Smagic	C	4	B2 T2	91.1	36.79
Smagic	C	4	B2 C2	147	37.18
Smagic	C	4	B2 T5	120	36.85
Smagic	C	4	B2 C4	145.2	37.25
Smagic	C	4	End B2	68.6	36.71
Smagic	C	4	Start B3	41.5	36.39
Smagic	C	4	B3 T2	92.2	37.22
Smagic	C	4	B3 C2	126	37.37
Smagic	C	4	B3 T5	98.8	37.19
Smagic	C	4	B3 C4	141	37.22
Smagic	C	4	End B3	77	37.06
Smagic	C	4	Start B4	68.2	36.74
Smagic	C	4	B4 T2	87.3	37.08
Smagic	C	4	B4 C2	123	37.55
Smagic	C	4	B4 T5	117.9	37.29
Smagic	C	4	B4 C4	147.6	37.51

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Smagic	C	4	End B4	84	37
Tank	B	1	start 1	42	36.77
Tank	B	1	B1 T2	106.2	37.01
Tank	B	1	B1 C2	153	37.78
Tank	B	1	B1 T5	118.9	37.16
Tank	B	1	B1 C4	157.2	37.86
Tank	B	1	End B1	89.6	36.7
Tank	B	1	Start 2	43.7	36.8
Tank	B	1	B2 T2	110.7	37.24
Tank	B	1	B2 C2	148.8	37.88
Tank	B	1	B2 T5	144	37.17
Tank	B	1	B2 C4	139.1	37.86
Tank	B	1	End B2	85.6	36.85
Tank	B	1	Start B3	48.56	36.53
Tank	B	1	B3 T2	109.8	37.03
Tank	B	1	B3 C2	153.6	37.65
Tank	B	1	B3 T5	117.5	37.24
Tank	B	1	B3 C4	144	37.92
Tank	B	1	End B3	87.3	37
Tank	B	1	Start B4	48.9	37.02
Tank	B	1	B4 T2	113.5	37.17
Tank	B	1	B4 C2	144	38.15
Tank	B	1	B4 T5	116.1	
Tank	B	1	B4 C4	148.8	37.96
Tank	B	1	End B4	89.3	37.34
Tank	C	2	start 1	44.2	
Tank	C	2	B1 T2	114.9	37.09
Tank	C	2	B1 C2	147	37.74
Tank	C	2	B1 T5	103.9	37.04
Tank	C	2	B1 C4	121.8	37.02
Tank	C	2	End B1	70	36.67
Tank	C	2	Start 2	57.6	36.8
Tank	C	2	B2 T2	114.9	37.18
Tank	C	2	B2 C2	156	37.93
Tank	C	2	B2 T5	109.7	37.47
Tank	C	2	B2 C4	144	37.89
Tank	C	2	End B2	67.36	37.17
Tank	C	2	Start B3	49.07	36.82
Tank	C	2	B3 T2		37.15
Tank	C	2	B3 C2		38.02
Tank	C	2	B3 T5	112.6	37.32
Tank	C	2	B3 C4	150	38.02
Tank	C	2	End B3	90.7	37.26
Tank	C	2	Start B4	61.68	37.23
Tank	C	2	B4 T2	114.9	37.47
Tank	C	2	B4 C2	144.6	37.98
Tank	C	2	B4 T5	118.6	37.31
Tank	C	2	B4 C4	145.8	38.02

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Tank	C	2	End B4	90	36.81
Tank	A	3	start 1	96.6	36.34
Tank	A	3	B1 T2	114	37.16
Tank	A	3	B1 C2	147	37.72
Tank	A	3	B1 T5	91.2	37.14
Tank	A	3	B1 C4		37.7
Tank	A	3	End B1	86.5	36.84
Tank	A	3	Start 2	54	36.91
Tank	A	3	B2 T2		37.34
Tank	A	3	B2 C2		37.77
Tank	A	3	B2 T5	96	36.92
Tank	A	3	B2 C4		37.77
Tank	A	3	End B2		36.79
Tank	A	3	Start B3	44.7	36.67
Tank	A	3	B3 T2	92.1	37.03
Tank	A	3	B3 C2		37.97
Tank	A	3	B3 T5	114.9	37.34
Tank	A	3	B3 C4	138.8	38.07
Tank	A	3	End B3		36.84
Tank	A	3	Start B4	52.2	37.06
Tank	A	3	B4 T2		37.27
Tank	A	3	B4 C2		37.9
Tank	A	3	B4 T5		37.33
Tank	A	3	B4 C4		38
Tank	A	3	End B4	83	37.07
Tank	D	4	start 1	44	
Tank	D	4	B1 T2		
Tank	D	4	B1 C2	144	
Tank	D	4	B1 T5	116	
Tank	D	4	B1 C4	147	
Tank	D	4	End B1	91	
Tank	D	4	Start 2	57	
Tank	D	4	B2 T2	115	
Tank	D	4	B2 C2	142	
Tank	D	4	B2 T5	119	
Tank	D	4	B2 C4		
Tank	D	4	End B2	88	
Tank	D	4	Start B3	48	
Tank	D	4	B3 T2		
Tank	D	4	B3 C2		
Tank	D	4	B3 T5	110	
Tank	D	4	B3 C4	139	
Tank	D	4	End B3	85	
Tank	D	4	Start B4	54	
Tank	D	4	B4 T2		
Tank	D	4	B4 C2	140	
Tank	D	4	B4 T5	111	
Tank	D	4	B4 C4	141	

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Tank	D	4	End B4	68	
Sassy	A	1	start 1	39.1	36.78
Sassy	A	1	B1 T2	102	37.69
Sassy	A	1	B1 C2	135	38.32
Sassy	A	1	B1 T5	125	37.81
Sassy	A	1	B1 C4	136.2	38
Sassy	A	1	End B1	90.3	36.82
Sassy	A	1	Start 2	52.9	36.87
Sassy	A	1	B2 T2	105.2	37.33
Sassy	A	1	B2 C2	136.2	37.97
Sassy	A	1	B2 T5	108	37.28
Sassy	A	1	B2 C4		37.71
Sassy	A	1	End B2	88.5	36.92
Sassy	A	1	Start B3	57	36.73
Sassy	A	1	B3 T2	104.8	37.16
Sassy	A	1	B3 C2	141	37.66
Sassy	A	1	B3 T5	99.6	37.13
Sassy	A	1	B3 C4	136.8	37.64
Sassy	A	1	End B3	81.9	36.8
Sassy	A	1	Start B4	44.7	36.84
Sassy	A	1	B4 T2	94.9	37.1
Sassy	A	1	B4 C2	118.8	37.61
Sassy	A	1	B4 T5	102	37.1
Sassy	A	1	B4 C4	126	37.54
Sassy	A	1	End B4	82.5	36.8
Sassy	D	2	start 1	48	36.8
Sassy	D	2	B1 T2	112.28	37.15
Sassy	D	2	B1 C2	130.9	37.72
Sassy	D	2	B1 T5	90	37
Sassy	D	2	B1 C4	141.6	37.71
Sassy	D	2	End B1	81	36.94
Sassy	D	2	Start 2	50.79	37.16
Sassy	D	2	B2 T2	114	37.28
Sassy	D	2	B2 C2	144	37.72
Sassy	D	2	B2 T5	120	37.27
Sassy	D	2	B2 C4	144	37.79
Sassy	D	2	End B2	80.43	36.99
Sassy	D	2	Start B3	48.99	36.93
Sassy	D	2	B3 T2		37.37
Sassy	D	2	B3 C2		37.86
Sassy	D	2	B3 T5		37.69
Sassy	D	2	B3 C4		37.92
Sassy	D	2	End B3	96.35	37.33
Sassy	D	2	Start B4		37.28
Sassy	D	2	B4 T2	128	37.37
Sassy	D	2	B4 C2	146.3	37.92
Sassy	D	2	B4 T5	124.2	37.42
Sassy	D	2	B4 C4	150	37.9

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Sassy	D	2	End B4	102	37.4
Sassy	B	3	start 1	48	36.6
Sassy	B	3	B1 T2	109.3	37.26
Sassy	B	3	B1 C2	130.5	37.44
Sassy	B	3	B1 T5	107.1	36.73
Sassy	B	3	B1 C4	128.5	38.01
Sassy	B	3	End B1	83.4	36.87
Sassy	B	3	Start 2	49.2	36.37
Sassy	B	3	B2 T2	106.7	36.98
Sassy	B	3	B2 C2	128.2	37.35
Sassy	B	3	B2 T5	119	37.21
Sassy	B	3	B2 C4	123	37.29
Sassy	B	3	End B2	72.9	36.75
Sassy	B	3	Start B3	46.7	36.66
Sassy	B	3	B3 T2	107.6	37.11
Sassy	B	3	B3 C2	132	37.51
Sassy	B	3	B3 T5	118.5	37.37
Sassy	B	3	B3 C4	130.5	37.51
Sassy	B	3	End B3	85.8	36.9
Sassy	B	3	Start B4	46.5	36.71
Sassy	B	3	B4 T2	98	37.08
Sassy	B	3	B4 C2	145.2	37.4
Sassy	B	3	B4 T5	104.6	36.95
Sassy	B	3	B4 C4	124.2	37.37
Sassy	B	3	End B4	79.3	36.93
Sassy	C	4	start 1	46.9	36.83
Sassy	C	4	B1 T2	117.7	37.35
Sassy	C	4	B1 C2	144	37.7
Sassy	C	4	B1 T5	134.2	37.31
Sassy	C	4	B1 C4	146.4	37.75
Sassy	C	4	End B1	73.1	37.02
Sassy	C	4	Start 2	55.6	36.58
Sassy	C	4	B2 T2	118.2	37.12
Sassy	C	4	B2 C2		37.48
Sassy	C	4	B2 T5	119	36.98
Sassy	C	4	B2 C4	137.5	37.41
Sassy	C	4	End B2	85.8	36.81
Sassy	C	4	Start B3	63.6	36.55
Sassy	C	4	B3 T2	110.6	36.94
Sassy	C	4	B3 C2	138.6	37.52
Sassy	C	4	B3 T5	120	37.15
Sassy	C	4	B3 C4	134.2	37.46
Sassy	C	4	End B3	54	37.06
Sassy	C	4	Start B4	53.6	36.51
Sassy	C	4	B4 T2	117.7	37.07
Sassy	C	4	B4 C2	137	37.49
Sassy	C	4	B4 T5	115.4	37.09
Sassy	C	4	B4 C4	133.6	37.51

Horse	Diet	Period	Time	HR-bpm	Temp-°C
Sassy	C	4	End B4	86.5	37.04
Stimpy	D	1	start 1	47.6	36.75
Stimpy	D	1	B1 T2	119.1	37.75
Stimpy	D	1	B1 C2	150.6	37.91
Stimpy	D	1	B1 T5	109.7	37.15
Stimpy	D	1	B1 C4	138	37.79
Stimpy	D	1	End B1	81	37.91
Stimpy	D	1	Start 2	43.98	36.89
Stimpy	D	1	B2 T2	105.96	37.25
Stimpy	D	1	B2 C2	144	37.88
Stimpy	D	1	B2 T5	104.4	37.15
Stimpy	D	1	B2 C4	126.6	37.6
Stimpy	D	1	End B2	73.4	36.84
Stimpy	D	1	Start B3	42.3	36.57
Stimpy	D	1	B3 T2	109.2	37.2
Stimpy	D	1	B3 C2	154.2	37.9
Stimpy	D	1	B3 T5		37.3
Stimpy	D	1	B3 C4		37.88
Stimpy	D	1	End B3	90	37.14
Stimpy	D	1	Start B4	41.6	36.94
Stimpy	D	1	B4 T2	109.2	37.1
Stimpy	D	1	B4 C2	144	37.77
Stimpy	D	1	B4 T5	108	37.29
Stimpy	D	1	B4 C4		37.71
Stimpy	D	1	End B4	83.4	37.38
Stimpy	B	2	start 1	65.5	36.58
Stimpy	B	2	B1 T2	110.14	37.25
Stimpy	B	2	B1 C2	142.8	37.87
Stimpy	B	2	B1 T5	104.14	37.21
Stimpy	B	2	B1 C4	144	37.84
Stimpy	B	2	End B1	76.67	37.35
Stimpy	B	2	Start 2	66	36.82
Stimpy	B	2	B2 T2	104.14	37.14
Stimpy	B	2	B2 C2	139.2	37.79
Stimpy	B	2	B2 T5	102	37.06
Stimpy	B	2	B2 C4	132	37.7
Stimpy	B	2	End B2		37.15
Stimpy	B	2	Start B3	39.75	36.69
Stimpy	B	2	B3 T2	105.6	37.2
Stimpy	B	2	B3 C2	145.8	38.04
Stimpy	B	2	B3 T5	103.6	37.18
Stimpy	B	2	B3 C4	135.27	37.9
Stimpy	B	2	End B3	58	37.19
Stimpy	B	2	Start B4	36.16	36.98
Stimpy	B	2	B4 T2	106.28	37.25
Stimpy	B	2	B4 C2	135.82	37.97
Stimpy	B	2	B4 T5	103.28	37.64
Stimpy	B	2	B4 C4	141.6	38.02

Horse	Diet	Period	Time	HR-bpm	Temp-ºC
Stimpy	B	2	End B4	66.3	37.29
Stimpy	C	3	start 1	49.4	36.62
Stimpy	C	3	B1 T2	106.3	37.04
Stimpy	C	3	B1 C2	144	37.71
Stimpy	C	3	B1 T5	101.1	37.19
Stimpy	C	3	B1 C4	132	37.8
Stimpy	C	3	End B1	78	36.84
Stimpy	C	3	Start 2	41.7	36.8
Stimpy	C	3	B2 T2	98.8	37.08
Stimpy	C	3	B2 C2	136.4	37.77
Stimpy	C	3	B2 T5	102	37.14
Stimpy	C	3	B2 C4	135.2	37.88
Stimpy	C	3	End B2	81.3	37.07
Stimpy	C	3	Start B3	40.6	36.86
Stimpy	C	3	B3 T2	108.9	37.26
Stimpy	C	3	B3 C2	148.8	37.01
Stimpy	C	3	B3 T5	95.1	37.37
Stimpy	C	3	B3 C4	151.8	37.77
Stimpy	C	3	End B3	82.1	37.2
Stimpy	C	3	Start B4	44.1	37.02
Stimpy	C	3	B4 T2	108.9	37.31
Stimpy	C	3	B4 C2	137.4	37.84
Stimpy	C	3	B4 T5	104.8	37.29
Stimpy	C	3	B4 C4	124.2	37.98
Stimpy	C	3	End B4	85	37.16
Stimpy	A	4	start 1	55	36.81
Stimpy	A	4	B1 T2	98.4	37.28
Stimpy	A	4	B1 C2	138	37.87
Stimpy	A	4	B1 T5	103.3	37.74
Stimpy	A	4	B1 C4	137.5	38.32
Stimpy	A	4	End B1	81.36	37.62
Stimpy	A	4	Start 2	45.6	36.99
Stimpy	A	4	B2 T2	103.3	37.36
Stimpy	A	4	B2 C2	134.2	38.01
Stimpy	A	4	B2 T5	104	37.24
Stimpy	A	4	B2 C4	136.4	37.9
Stimpy	A	4	End B2	82	36.98
Stimpy	A	4	Start B3	37.1	36.89
Stimpy	A	4	B3 T2		37.26
Stimpy	A	4	B3 C2	128.7	37.63
Stimpy	A	4	B3 T5		37.41
Stimpy	A	4	B3 C4	126	37.92
Stimpy	A	4	End B3	77.1	37.26
Stimpy	A	4	Start B4	40.7	36.95
Stimpy	A	4	B4 T2		37.15
Stimpy	A	4	B4 C2		37.7
Stimpy	A	4	B4 T5		37.23
Stimpy	A	4	B4 C4	118.6	37.62
Stimpy	A	4	End B4	77.1	37.11

Horse	Fiber	Fat	Diet	Period	Time	Insulin (µIU/ml)
Goliath	M	N	C	1	60 min Post	3.85
Goliath	M	N	C	1	Pre	2.29
Goliath	M	N	C	1	Start B1	30.78
Goliath	M	N	C	1	Start B3	8.08
Goliath	G	N	A	2	60 min Post	3.48
Goliath	G	N	A	2	Pre	1.93
Goliath	G	N	A	2	Start B1	3.23
Goliath	G	N	A	2	Start B3	11.87
Goliath	M	Y	D	3	60 min Post	5.10
Goliath	M	Y	D	3	Pre	1.19
Goliath	M	Y	D	3	Start B1	8.07
Goliath	M	Y	D	3	Start B3	3.50
Goliath	G	Y	B	4	60 min Post	1.03
Goliath	G	Y	B	4	Pre	0.96
Goliath	G	Y	B	4	Start B1	3.49
Goliath	G	Y	B	4	Start B3	2.34
Sassy	G	N	A	1	60 min Post	7.15
Sassy	G	N	A	1	Pre	1.53
Sassy	G	N	A	1	Start B1	6.49
Sassy	G	N	A	1	Start B3	6.13
Sassy	M	Y	D	2	60 min Post	7.86
Sassy	M	Y	D	2	Pre	1.32
Sassy	M	Y	D	2	Start B1	26.57
Sassy	M	Y	D	2	Start B3	20.85
Sassy	G	Y	B	3	60 min Post	3.89
Sassy	G	Y	B	3	Pre	1.35
Sassy	G	Y	B	3	Start B1	3.56
Sassy	G	Y	B	3	Start B3	7.21
Sassy	M	N	C	4	60 min Post	11.92
Sassy	M	N	C	4	Pre	2.61
Sassy	M	N	C	4	Start B1	33.09
Sassy	M	N	C	4	Start B3	16.71
Smagic	M	Y	D	1	60 min Post	18.42
Smagic	M	Y	D	1	Pre	5.42
Smagic	M	Y	D	1	Start B1	10.43
Smagic	M	Y	D	1	Start B3	24.21
Smagic	G	Y	B	2	60 min Post	6.60
Smagic	G	Y	B	2	Pre	1.56
Smagic	G	Y	B	2	Start B1	4.17
Smagic	G	Y	B	2	Start B3	11.05
Smagic	G	N	A	3	60 min Post	11.14
Smagic	G	N	A	3	Pre	2.43
Smagic	G	N	A	3	Start B1	6.29
Smagic	G	N	A	3	Start B3	5.43
Smagic	M	N	C	4	60 min Post	14.60
Smagic	M	N	C	4	Pre	2.64
Smagic	M	N	C	4	Start B1	35.07
Smagic	M	N	C	4	Start B3	19.65

Horse	Fiber	Fat	Diet	Period	Time	Insulin (µIU/ml)
Starlet	G	N	A	1	60 min Post	4.70
Starlet	G	N	A	1	Pre	1.78
Starlet	G	N	A	1	Start B1	5.16
Starlet	G	N	A	1	Start B3	8.22
Starlet	M	N	C	2	60 min Post	12.76
Starlet	M	N	C	2	Pre	0.91
Starlet	M	N	C	2	Start B1	23.81
Starlet	M	N	C	2	Start B3	40.79
Starlet	G	Y	B	3	60 min Post	5.21
Starlet	G	Y	B	3	Pre	1.25
Starlet	G	Y	B	3	Start B1	3.12
Starlet	G	Y	B	3	Start B3	6.29
Starlet	M	Y	D	4	60 min Post	9.04
Starlet	M	Y	D	4	Pre	0.84
Starlet	M	Y	D	4	Start B1	17.27
Starlet	M	Y	D	4	Start B3	22.06
Stimpy	M	Y	D	1	60 min Post	11.96
Stimpy	M	Y	D	1	Pre	1.74
Stimpy	M	Y	D	1	Start B1	10.36
Stimpy	M	Y	D	1	Start B3	20.34
Stimpy	G	Y	B	2	60 min Post	4.45
Stimpy	G	Y	B	2	Pre	1.17
Stimpy	G	Y	B	2	Start B1	2.50
Stimpy	G	Y	B	2	Start B3	10.87
Stimpy	M	N	C	3	60 min Post	7.41
Stimpy	M	N	C	3	Pre	0.82
Stimpy	M	N	C	3	Start B1	
Stimpy	M	N	C	3	Start B3	26.38
Stimpy	G	N	A	4	60 min Post	7.21
Stimpy	G	N	A	4	Pre	0.76
Stimpy	G	N	A	4	Start B1	8.62
Stimpy	G	N	A	4	Start B3	3.75
Tank	G	Y	B	1	60 min Post	1.90
Tank	G	Y	B	1	Pre	1.27
Tank	G	Y	B	1	Start B1	3.23
Tank	G	Y	B	1	Start B3	4.41
Tank	M	N	C	2	60 min Post	7.60
Tank	M	N	C	2	Pre	1.58
Tank	M	N	C	2	Start B1	11.05
Tank	M	N	C	2	Start B3	16.20
Tank	G	N	A	3	60 min Post	4.23
Tank	G	N	A	3	Pre	0.81
Tank	G	N	A	3	Start B1	5.36
Tank	G	N	A	3	Start B3	3.28
Tank	M	Y	D	4	60 min Post	3.66
Tank	M	Y	D	4	Pre	
Tank	M	Y	D	4	Start B1	7.26
Tank	M	Y	D	4	Start B3	12.80

Horse	Fiber	Fat	Diet	Period	Time	Cortisol µg/ml)
Goliath	M	N	C	1	Start B1	1.62
Goliath	M	N	C	1	End B2	3.23
Goliath	M	N	C	1	Start B3	1.59
Goliath	M	N	C	1	End B4	3.46
Goliath	M	N	C	1	60 Min Post	0.20
Goliath	G	N	A	2	Start B1	2.09
Goliath	G	N	A	2	End B2	2.55
Goliath	G	N	A	2	Start B3	0.93
Goliath	G	N	A	2	End B4	2.11
Goliath	G	N	A	2	60 Min Post	0.20
Goliath	M	Y	D	3	Start B1	2.35
Goliath	M	Y	D	3	End B2	3.13
Goliath	M	Y	D	3	Start B3	1.78
Goliath	M	Y	D	3	End B4	3.75
Goliath	M	Y	D	3	60 Min Post	1.37
Goliath	G	Y	B	4	Start B1	1.37
Goliath	G	Y	B	4	End B2	2.58
Goliath	G	Y	B	4	Start B3	1.35
Goliath	G	Y	B	4	End B4	3.34
Goliath	G	Y	B	4	60 Min Post	0.20
Sassy	G	N	A	1	Start B1	1.88
Sassy	G	N	A	1	End B2	4.26
Sassy	G	N	A	1	Start B3	2.17
Sassy	G	N	A	1	End B4	2.39
Sassy	G	N	A	1	60 Min Post	1.01
Sassy	M	Y	D	2	Start B1	3.20
Sassy	M	Y	D	2	End B2	3.35
Sassy	M	Y	D	2	Start B3	1.69
Sassy	M	Y	D	2	End B4	4.41
Sassy	M	Y	D	2	60 Min Post	1.60
Sassy	G	Y	B	3	Start B1	1.97
Sassy	G	Y	B	3	End B2	2.67
Sassy	G	Y	B	3	Start B3	1.56
Sassy	G	Y	B	3	End B4	2.79
Sassy	G	Y	B	3	60 Min Post	1.34
Sassy	M	N	C	4	Start B1	2.52
Sassy	M	N	C	4	End B2	3.23
Sassy	M	N	C	4	Start B3	2.21
Sassy	M	N	C	4	End B4	4.12
Sassy	M	N	C	4	60 Min Post	0.42
Smagic	M	Y	D	1	Start B1	1.53
Smagic	M	Y	D	1	End B2	3.55
Smagic	M	Y	D	1	Start B3	2.27
Smagic	M	Y	D	1	End B4	3.92
Smagic	M	Y	D	1	60 Min Post	0.32
Smagic	G	Y	B	2	Start B1	2.32
Smagic	G	Y	B	2	End B2	3.57
Smagic	G	Y	B	2	Start B3	1.63

Horse	Fiber	Fat	Diet	Period	Time	Cortisol (μg/ml)
Smagic	G	Y	B	2	End B4	2.09
Smagic	G	Y	B	2	60 Min Post	0.07
Smagic	G	N	A	3	Start B1	1.29
Smagic	G	N	A	3	End B2	2.60
Smagic	G	N	A	3	Start B3	1.64
Smagic	G	N	A	3	End B4	3.07
Smagic	G	N	A	3	60 Min Post	0.20
Smagic	M	N	C	4	Start B1	3.09
Smagic	M	N	C	4	End B2	4.82
Smagic	M	N	C	4	Start B3	2.79
Smagic	M	N	C	4	End B4	4.51
Smagic	M	N	C	4	60 Min Post	2.10
Starlet	G	N	A	1	Start B1	1.79
Starlet	G	N	A	1	End B2	3.40
Starlet	G	N	A	1	Start B3	1.70
Starlet	G	N	A	1	End B4	2.46
Starlet	G	N	A	1	60 Min Post	0.09
Starlet	M	N	C	2	Start B1	2.67
Starlet	M	N	C	2	End B2	2.93
Starlet	M	N	C	2	Start B3	1.33
Starlet	M	N	C	2	End B4	3.38
Starlet	M	N	C	2	60 Min Post	0.38
Starlet	G	Y	B	3	Start B1	2.22
Starlet	G	Y	B	3	End B2	2.96
Starlet	G	Y	B	3	Start B3	2.07
Starlet	G	Y	B	3	End B4	2.50
Starlet	G	Y	B	3	60 Min Post	0.16
Starlet	M	Y	D	4	Start B1	2.51
Starlet	M	Y	D	4	End B2	4.04
Starlet	M	Y	D	4	Start B3	2.57
Starlet	M	Y	D	4	End B4	5.10
Starlet	M	Y	D	4	60 Min Post	0.93
Stimpy	M	Y	D	1	Start B1	1.90
Stimpy	M	Y	D	1	End B2	3.19
Stimpy	M	Y	D	1	Start B3	1.76
Stimpy	M	Y	D	1	End B4	2.07
Stimpy	M	Y	D	1	60 Min Post	0.68
Stimpy	G	Y	B	2	Start B1	1.69
Stimpy	G	Y	B	2	End B2	2.24
Stimpy	G	Y	B	2	Start B3	1.50
Stimpy	G	Y	B	2	End B4	2.69
Stimpy	G	Y	B	2	60 Min Post	0.40
Stimpy	M	N	C	3	Start B1	2.42
Stimpy	M	N	C	3	End B2	3.46
Stimpy	M	N	C	3	Start B3	2.15
Stimpy	M	N	C	3	End B4	2.92
Stimpy	M	N	C	3	60 Min Post	0.21
Stimpy	G	N	A	4	Start B1	1.02
Stimpy	G	N	A	4	End B2	3.70

Horse	Fiber	Fat	Diet	Period	Time	Cortisol (μg/ml)
Stimpy	G	N	A	4	Start B3	1.91
Stimpy	G	N	A	4	End B4	2.92
Stimpy	G	N	A	4	60 Min Post	0.15
Tank	G	Y	B	1	Start B1	1.49
Tank	G	Y	B	1	End B2	3.19
Tank	G	Y	B	1	Start B3	1.05
Tank	G	Y	B	1	End B4	2.01
Tank	G	Y	B	1	60 Min Post	0.20
Tank	M	N	C	2	Start B1	2.00
Tank	M	N	C	2	End B2	0.22
Tank	M	N	C	2	Start B3	1.87
Tank	M	N	C	2	End B4	3.25
Tank	M	N	C	2	60 Min Post	3.35
Tank	G	N	A	3	Start B1	0.89
Tank	G	N	A	3	End B2	2.30
Tank	G	N	A	3	Start B3	1.21
Tank	G	N	A	3	End B4	2.66
Tank	G	N	A	3	60 Min Post	0.36
Tank	M	Y	D	4	Start B1	1.68
Tank	M	Y	D	4	End B2	1.91
Tank	M	Y	D	4	Start B3	1.39
Tank	M	Y	D	4	End B4	3.06
Tank	M	Y	D	4	60 Min Post	0.20

Horse	Period	Fiber	Fat	Diet	Time	NEFA (mEq/l)	TG (mg/dl)
Goliath	1	M	N	C	1 Day Post	0.69	22.53
Goliath	1	M	N	C	End B2	1.84	39.75
Goliath	1	M	N	C	End B4	1.68	67.87
Goliath	1	M	N	C	Start B1	0.37	28.62
Goliath	1	M	N	C	Start B3	0.71	52.99
Goliath	2	G	N	A	1 Day Post	0.95	79.19
Goliath	2	G	N	A	End B2	1.57	312.72
Goliath	2	G	N	A	End B4	2.26	312.22
Goliath	2	G	N	A	Start B1	1.45	82.16
Goliath	2	G	N	A	Start B3	0.70	371.03
Goliath	3	M	Y	D	1 Day Post	0.91	32.81
Goliath	3	M	Y	D	End B2	1.16	42.03
Goliath	3	M	Y	D	End B4	1.75	35.99
Goliath	3	M	Y	D	Start B1	0.39	19.88
Goliath	3	M	Y	D	Start B3	0.39	66.74
Goliath	4	G	Y	B	1 Day Post	0.47	71.31
Goliath	4	G	Y	B	End B2	1.24	241.17
Goliath	4	G	Y	B	End B4	1.99	428.93
Goliath	4	G	Y	B	Start B1	0.21	111.31
Goliath	4	G	Y	B	Start B3	0.52	302.12
Sas	1	G	N	A	1 Day Post	0.79	28.79
Sas	1	G	N	A	End B2	1.69	48.59
Sas	1	G	N	A	End B4	1.89	39.06
Sas	1	G	N	A	Start B1	0.59	53.98
Sas	1	G	N	A	Start B3	0.77	71.39
Sas	2	M	Y	D	1 Day Post	0.24	21.87
Sas	2	M	Y	D	End B2	1.01	18.07
Sas	2	M	Y	D	End B4	1.37	19.31
Sas	2	M	Y	D	Start B1	0.27	29.10
Sas	2	M	Y	D	Start B3	0.30	40.30
Sas	3	G	Y	B	1 Day Post	0.46	16.90
Sas	3	G	Y	B	End B2	1.51	51.49
Sas	3	G	Y	B	End B4	1.85	60.48
Sas	3	G	Y	B	Start B1	0.89	11.62
Sas	3	G	Y	B	Start B3	0.73	56.47
Sas	4	M	N	C	1 Day Post	0.32	19.31
Sas	4	M	N	C	End B2	0.98	31.59
Sas	4	M	N	C	End B4	1.04	15.42
Sas	4	M	N	C	Start B1	0.06	31.59
Sas	4	M	N	C	Start B3	0.16	32.75
Smagic	1	M	Y	D	1 Day Post	0.61	33.02
Smagic	1	M	Y	D	End B2	1.17	29.12
Smagic	1	M	Y	D	End B4	1.07	49.58
Smagic	1	M	Y	D	Start B1	0.82	31.69
Smagic	1	M	Y	D	Start B3	0.65	53.65
Smagic	2	G	Y	B	1 Day Post	0.77	18.80
Smagic	2	G	Y	B	End B2	1.58	189.78

Horse	Period	Fiber	Fat	Diet	Time	NEFA (mEq/l)	TG (mg/dl)
Smagic	2	G	Y	B	End B4	1.76	240.05
Smagic	2	G	Y	B	Start B1	0.99	79.78
Smagic	2	G	Y	B	Start B3	0.62	204.36
Smagic	3	G	N	A	1 Day Post	0.50	29.12
Smagic	3	G	N	A	End B2	1.31	72.23
Smagic	3	G	N	A	End B4	1.17	99.92
Smagic	3	G	N	A	Start B1	0.57	47.06
Smagic	3	G	N	A	Start B3	0.62	80.28
Smagic	4	M	N	C	1 Day Post	0.31	48.49
Smagic	4	M	N	C	End B2	1.00	23.15
Smagic	4	M	N	C	End B4	0.97	11.83
Smagic	4	M	N	C	Start B1	0.19	52.33
Smagic	4	M	N	C	Start B3	0.23	40.77
Star	1	G	N	A	1 Day Post	0.55	32.28
Star	1	G	N	A	End B2	1.55	122.54
Star	1	G	N	A	End B4	1.79	112.63
Star	1	G	N	A	Start B1	0.90	71.96
Star	1	G	N	A	Start B3	1.08	158.19
Star	2	M	N	C	1 Day Post	0.52	21.77
Star	2	M	N	C	End B2	0.97	19.54
Star	2	M	N	C	End B4	1.10	14.58
Star	2	M	N	C	Start B1	0.32	14.58
Star	2	M	N	C	Start B3	0.27	37.10
Star	3	G	Y	B	1 Day Post	0.49	41.13
Star	3	G	Y	B	End B2	1.37	161.66
Star	3	G	Y	B	End B4	1.98	282.24
Star	3	G	Y	B	Start B1	0.67	45.34
Star	3	G	Y	B	Start B3	0.52	251.61
Star	4	M	Y	D	1 Day Post	0.20	25.29
Star	4	M	Y	D	End B2	0.98	16.94
Star	4	M	Y	D	End B4	1.38	19.36
Star	4	M	Y	D	Start B1	0.25	9.28
Star	4	M	Y	D	Start B3	0.22	50.81
Stimpy	1	M	Y	D	1 Day Post	0.78	15.57
Stimpy	1	M	Y	D	End B2	1.25	39.92
Stimpy	1	M	Y	D	End B4	1.31	49.60
Stimpy	1	M	Y	D	Start B1	0.32	50.25
Stimpy	1	M	Y	D	Start B3	0.57	104.98
Stimpy	2	G	Y	B	1 Day Post	0.55	22.94
Stimpy	2	G	Y	B	End B2	1.20	159.70
Stimpy	2	G	Y	B	End B4	1.20	189.55
Stimpy	2	G	Y	B	Start B1	0.80	65.17
Stimpy	2	G	Y	B	Start B3	0.57	175.40
Stimpy	3	M	N	C	1 Day Post	0.46	18.03
Stimpy	3	M	N	C	End B2	1.08	32.84
Stimpy	3	M	N	C	End B4	1.18	17.91
Stimpy	3	M	N	C	Start B1	0.44	15.42
Stimpy	3	M	N	C	Start B3	0.31	37.81

Horse	Period	Fiber	Fat	Diet	Time	NEFA (mEq/l)	TG (mg/dl)
Stimpy	4	G	N	A	1 Day Post	0.38	37.66
Stimpy	4	G	N	A	End B2	1.35	54.86
Stimpy	4	G	N	A	End B4	1.44	41.54
Stimpy	4	G	N	A	Start B1	0.56	41.54
Stimpy	4	G	N	A	Start B3	0.52	62.69
Tank	1	G	Y	B	1 Day Post	0.59	35.99
Tank	1	G	Y	B	End B2	2.65	160.60
Tank	1	G	Y	B	End B4	1.34	370.47
Tank	1	G	Y	B	Start B1	0.39	91.11
Tank	1	G	Y	B	Start B3	1.35	262.25
Tank	2	M	N	C	1 Day Post	0.64	18.76
Tank	2	M	N	C	End B2	1.05	35.16
Tank	2	M	N	C	End B4	1.36	35.74
Tank	2	M	N	C	Start B1	0.19	63.14
Tank	2	M	N	C	Start B3	0.46	48.32
Tank	3	G	N	A	1 Day Post	0.58	35.08
Tank	3	G	N	A	End B2	1.11	111.34
Tank	3	G	N	A	End B4	1.73	93.62
Tank	3	G	N	A	Start B1	0.30	86.07
Tank	3	G	N	A	Start B3	0.68	98.66
Tank	4	M	Y	D	1 Day Post	0.75	19.97
Tank	4	M	Y	D	End B2	0.75	32.31
Tank	4	M	Y	D	End B4	0.99	26.93
Tank	4	M	Y	D	Start B1	0.15	24.91
Tank	4	M	Y	D	Start B3	0.53	49.59

Horse	Fiber	Fat	Diet	Period	Time	Aldo (pg/ml)
Goliath	M	N	C	1	Start B1	9.39
Goliath	M	N	C	1	End B4	51.44
Goliath	M	N	C	1	1 D Post	18.76
Goliath	G	N	A	2	Start B1	33.80
Goliath	G	N	A	2	End B4	66.73
Goliath	G	N	A	2	1 D Post	50.08
Goliath	M	Y	D	3	Start B1	35.89
Goliath	M	Y	D	3	End B4	62.10
Goliath	M	Y	D	3	1 D Post	38.18
Goliath	G	Y	B	4	Start B1	19.89
Goliath	G	Y	B	4	End B4	77.16
Goliath	G	Y	B	4	1 D Post	9.70
Sassy	G	N	A	1	Start B1	43.12
Sassy	G	N	A	1	End B4	79.31
Sassy	G	N	A	1	1 D Post	97.74
Sassy	M	Y	D	2	Start B1	30.16
Sassy	M	Y	D	2	End B4	37.66
Sassy	M	Y	D	2	1 D Post	6.94
Sassy	G	Y	B	3	Start B1	96.21
Sassy	G	Y	B	3	End B4	68.77
Sassy	G	Y	B	3	1 D Post	61.00
Sassy	M	N	C	4	Start B1	28.74
Sassy	M	N	C	4	End B4	43.77
Sassy	M	N	C	4	1 D Post	17.89
Smagic	M	Y	D	1	Start B1	7.17
Smagic	M	Y	D	1	End B4	52.28
Smagic	M	Y	D	1	1 D Post	4.42
Smagic	G	Y	B	2	Start B1	19.24
Smagic	G	Y	B	2	End B4	87.42
Smagic	G	Y	B	2	1 D Post	55.89
Smagic	G	N	A	3	Start B1	69.42
Smagic	G	N	A	3	End B4	76.96
Smagic	G	N	A	3	1 D Post	10.46
Smagic	M	N	C	4	Start B1	45.16
Smagic	M	N	C	4	End B4	37.85
Smagic	M	N	C	4	1 D Post	11.71
Starlet	G	N	A	1	Start B1	47.04
Starlet	G	N	A	1	End B4	88.85
Starlet	G	N	A	1	1 D Post	31.50
Starlet	M	N	C	2	Start B1	29.46
Starlet	M	N	C	2	End B4	48.52
Starlet	M	N	C	2	1 D Post	5.32
Starlet	G	Y	B	3	Start B1	52.12
Starlet	G	Y	B	3	End B4	74.83
Starlet	G	Y	B	3	1 D Post	25.25
Starlet	M	Y	D	4	Start B1	23.43
Starlet	M	Y	D	4	End B4	44.98

Horse	Fiber	Fat	Diet	Period	Time	Aldo (pg/ml)
Starlet	M	Y	D	4	1 D Post	41.32
Stimpy	M	Y	D	1	Start B1	21.94
Stimpy	M	Y	D	1	End B4	62.03
Stimpy	M	Y	D	1	1 D Post	16.96
Stimpy	G	Y	B	2	Start B1	39.81
Stimpy	G	Y	B	2	End B4	99.42
Stimpy	G	Y	B	2	1 D Post	14.43
Stimpy	M	N	C	3	Start B1	19.80
Stimpy	M	N	C	3	End B4	48.73
Stimpy	M	N	C	3	1 D Post	4.39
Stimpy	G	N	A	4	Start B1	107.80
Stimpy	G	N	A	4	End B4	88.97
Stimpy	G	N	A	4	1 D Post	13.45
Tank	G	Y	B	1	Start B1	24.11
Tank	G	Y	B	1	End B4	59.45
Tank	G	Y	B	1	1 D Post	54.90
Tank	M	N	C	2	Start B1	17.58
Tank	M	N	C	2	End B4	17.85
Tank	M	N	C	2	1 D Post	23.77
Tank	G	N	A	3	Start B1	54.90
Tank	G	N	A	3	End B4	52.34
Tank	G	N	A	3	1 D Post	7.81
Tank	M	Y	D	4	Start B1	22.08
Tank	M	Y	D	4	End B4	29.03
Tank	M	Y	D	4	1 D Post	0.50

APPENDIX C

Raw Data- Sweat Composition

Horse	Period	Diet	Bout	pH	Na- mmol/L	K- mmol/L	Cl- mmol/L	Ca- mg/dL	Mg- mg/dL
Amici	1	P	1		121.20	56.09	145.35	18.49	5.16
Amici	1	P	2	7.01	98.50	36.69	128.05	10.46	2.74
Amici	1	P	3	7.60	85.95	33.87	119.90	8.90	1.70
Amici	1	P	4	7.71	91.00	34.86	125.55	6.86	1.49
Amici	2	C	1	7.73	118.60	48.54	172.40	6.19	1.80
Amici	2	C	2	7.59	110.70	43.44	151.20	10.16	3.26
Amici	2	C	3	7.57	110.20	38.34	142.30	7.60	2.23
Amici	2	C	4						
Amici	3	A	1	7.58	69.00	40.32	109.50	10.18	2.38
Amici	3	A	2	7.71	92.85	36.06	124.10	6.59	1.73
Amici	3	A	3	7.64	69.65	29.08	99.25	4.64	0.89
Avanti	1	P	1		80.45	46.57	134.30	10.07	3.89
Avanti	1	P	2	7.51	85.30	40.72	126.75	9.49	2.90
Avanti	1	P	3						
Avanti	1	P	4	7.67	65.20	28.34	86.90	5.78	1.74
Avanti	2	B	1	7.77	92.15	49.27	136.70	13.25	3.10
Avanti	2	B	2	7.83	110.50	46.17	138.70	10.88	2.25
Avanti	2	B	3	7.77	108.10	44.72	140.50	8.85	2.04
Avanti	2	B	4	7.88	113.00	48.14	147.90	7.54	1.71
Avanti	3	C	1	7.73	75.60	41.05	111.05	9.91	3.66
Avanti	3	C	2						
Avanti	3	C	3	7.67	60.20	30.72	89.65	5.86	1.69
Avanti	3	C	4	7.77	65.75	35.81	98.50	5.54	1.59
Avanti	4	A	1	7.74	78.95	41.81	129.80	9.71	4.41
Avanti	4	A	2	7.78	100.85	45.75	145.25	7.60	2.84
Avanti	4	A	3	7.67	78.80	44.69	123.40	7.05	2.46
Avanti	4	A	4	7.83	81.85	44.66	121.00	5.77	1.80
RePlay	1	P	1	7.43	87.80	50.94	141.05	12.73	3.02
RePlay	1	P	2	7.55	82.40	49.68	130.30	12.48	2.65
RePlay	1	P	3	7.64	90.15	54.54	141.95	12.33	2.39
RePlay	1	P	4	7.67	92.35	53.83	140.80	10.91	2.13
RePlay	2	C	1	6.85	89.90	60.31	148.10	19.75	3.66
RePlay	2	C	2						
RePlay	2	C	3						
RePlay	2	C	4						
RePlay	3	A	1	7.68	90.65	61.13	139.85	12.77	3.96
RePlay	3	A	2	7.70	74.45	37.31	107.55	8.11	1.95
RePlay	3	A	3	7.60	87.65	45.67	126.65	8.01	1.36
RePlay	3	A	4	7.70	92.00	46.70	129.50	7.44	1.22
RePlay	4	B	1	7.65	89.50	52.05	143.30	11.93	3.35
RePlay	4	B	2	7.56	95.75	54.82	147.60	9.54	2.67
RePlay	4	B	3	7.57	98.70	57.69	150.75	9.77	2.38
RePlay	4	B	4	7.68	110.00	56.20	158.05	8.00	2.05

Horse	Period	Diet	Bout	pH	Na- mmol/L	K- mmol/L	Cl- mmol/L	Ca- mg/dL	Mg- mg/dL
Showtime	1	P	1	7.66	82.15	45.36	131.55	12.47	3.01
Showtime	1	P	2	7.58	87.60	47.84	132.55	12.25	3.00
Showtime	1	P	3	7.55	85.75	41.97	130.65	12.84	2.86
Showtime	1	P	4	7.67	87.60	46.30	135.70	12.35	2.51
Showtime	2	A	1	7.63	105.95	54.91	166.70	12.10	2.16
Showtime	2	A	2	7.66	105.00	45.73	150.60	9.22	1.83
Showtime	2	A	3						
Showtime	2	A	4						
Showtime	3	B	1	7.73	118.55	62.47	186.55	8.80	3.86
Showtime	3	B	2	7.72	120.40	40.43	149.60	6.77	1.93
Showtime	3	B	3	7.70	128.85	51.97	166.70	9.59	1.81
Showtime	3	B	4	7.74	115.80	44.32	144.55	8.04	1.31
Showtime	4	C	1	7.61	101.70	77.46	175.45	13.92	3.85
Showtime	4	C	2	7.65	127.55	50.84	174.40	8.46	2.21
Showtime	4	C	3	7.71	119.45	42.46	157.40	9.50	1.91
Showtime	4	C	4	7.75	143.80	52.10	190.60	7.11	1.72
Sully	1	P	1	7.66	71.55	40.15	120.75	9.93	3.52
Sully	1	P	2	7.77	82.35	42.88	128.55	11.03	2.59
Sully	1	P	3	7.76	83.55	41.01	120.50	11.19	2.72
Sully	1	P	4	7.70	112.80	31.69	139.10	6.27	1.54
Sully	2	B	1	7.72	102.40	51.72	149.10	5.23	1.62
Sully	2	B	2						
Sully	2	B	3						
Sully	2	B	4						
Sully	3	C	1	7.79	110.90	56.13	155.15	8.98	3.18
Sully	3	C	2						
Sully	3	C	3						
Sully	3	C	4						
Sully	4	A	1	7.58	74.85	76.43	141.85	14.37	5.74
Sully	4	A	2	7.68	84.45	49.87	126.25	9.05	2.69
Sully	4	A	3	7.63	47.60	27.81	72.10	5.10	1.35
Sully	4	A	4	7.78	82.35	36.74	112.20	4.26	1.04
Vivo	1	P	1		71.85	53.27	124.45	15.61	4.84
Vivo	1	P	2	7.39	64.70	43.64	102.30	12.61	2.64
Vivo	1	P	3	7.56	54.40	31.16	84.30	8.62	1.79
Vivo	1	P	4	7.60	55.45	27.76	77.25	6.14	1.41
Vivo	2	A	1	7.49	93.35	53.92	145.70	21.91	4.19
Vivo	2	A	2	7.72	99.80	45.34	138.45	14.76	2.87
Vivo	2	A	3	7.72	85.15	58.22	135.30	15.70	2.73
Vivo	2	A	4	7.80	84.10	49.08	128.10	11.56	2.20
Vivo	3	B	1	7.55	82.05	40.49	118.55	11.64	2.87
Vivo	3	B	2	7.59	82.20	36.75	117.40	8.61	1.81
Vivo	3	B	3	7.63	85.85	40.35	122.60	6.81	1.38
Vivo	3	B	4	7.67	101.55	47.63	139.30	5.73	0.96
Vivo	4	C	1	7.78	86.60	59.02	154.10	18.38	3.10
Vivo	4	C	2	7.68	69.75	47.79	111.95	6.22	1.89
Vivo	4	C	3	7.65	79.05	50.80	121.90	8.99	2.53
Vivo	4	C	4						

Horse	Per.	Diet	Bout	Gluc-mg/dl	BUN-mg/dl	HCO3-mmol/l	nCa-mg/dl	nMg-mg/dl	Osmo.-mOsm/kg
Amici	1	P	1	8.50	37.00				352.00
Amici	1	P	2	2.00	16.50	1.10	8.61	2.54	271.00
Amici	1	P	3	4.00	15.50	5.35	9.94	1.80	242.00
Amici	1	P	4	2.50	15.50	7.00	8.10	1.64	251.00
Amici	2	C	1	1.00	13.00	6.20	7.40	1.99	234.00
Amici	2	C	2	4.00	0.00	3.00	11.27	3.45	215.00
Amici	2	C	3	4.00	0.00	3.10	8.34	2.35	214.00
Amici	2	C	4						
Amici	3	A	1	2.50	8.50	6.75	11.22	2.51	226.00
Amici	3	A	2	3.00	9.00	7.10	7.79	1.89	
Amici	3	A	3	3.00	8.00	5.45	5.31	0.95	
Avanti	1	P	1	13.00	16.50				282.50
Avanti	1	P	2	10.00	15.50	6.25	10.08	3.00	251.00
Avanti	1	P	3						
Avanti	1	P	4	14.50	5.00	6.30	6.69	1.89	190.50
Avanti	2	B	1	1.50	14.00	10.10	16.21	3.46	280.50
Avanti	2	B	2	5.00	19.00	13.00	13.70	2.56	299.50
Avanti	2	B	3	2.00	7.00	7.30	10.78	5.00	
Avanti	2	B	4	8.00	19.00	12.70	9.68	1.97	303.50
Avanti	3	C	1	2.50	5.50	6.50	11.88	4.05	236.00
Avanti	3	C	2						
Avanti	3	C	3	3.00	4.50	5.20	6.79	1.83	171.50
Avanti	3	C	4	1.50	5.00	4.75	6.72	1.78	189.50
Avanti	4	A	1	5.50	16.00	6.00	11.66	4.88	249.00
Avanti	4	A	2	5.00	16.50	5.60	9.30	3.18	288.00
Avanti	4	A	3	7.00	12.00	4.50	8.18	2.67	269.00
Avanti	4	A	4	3.00	9.00	3.90	7.20	2.05	241.00
RePlay	1	P	1	4.00	20.00	7.30	12.92	3.04	276.50
RePlay	1	P	2	12.50	18.50	8.20	13.55	2.77	252.00
RePlay	1	P	3	12.50	21.00	8.10	14.08	2.57	272.00
RePlay	1	P	4	17.00	26.00	8.80	12.67	2.31	278.00
RePlay	2	C	1	7.50	13.50	2.55			181.50
RePlay	2	C	2						
RePlay	2	C	3						
RePlay	2	C	4						
RePlay	3	A	1	2.00	12.00	6.70	14.88	4.31	331.50
RePlay	3	A	2	1.50	6.50	5.85	9.54	2.13	230.50
RePlay	3	A	3	2.50	13.00	6.25	8.98	1.44	260.00
RePlay	3	A	4	4.00	12.50	6.65	8.75	1.34	266.50
RePlay	4	B	1	2.50	53.00	6.45	13.71	3.62	345.50
RePlay	4	B	2	2.00	33.00	6.35	10.44	2.80	294.00
RePlay	4	B	3	4.00	40.50	6.80	10.74	2.51	362.50
RePlay	4	B	4	3.50	34.00	6.60	9.30	2.23	330.50
Showtime	1	P	1	9.00	12.50	6.80	14.36	3.25	247.50
Showtime	1	P	2	8.50	12.00	5.95	13.51	3.17	254.50
Showtime	1	P	3	6.50	11.50	5.25	13.97	3.00	241.00
Showtime	1	P	4	9.00	14.00	6.95	14.34	2.72	247.00
Showtime	2	A	1	3.50	13.00	9.70	13.74	2.31	312.00

Horse	Per.	Diet	Bout	Gluc-mg/dl	BUN-mg/dl	HCO3-mmol/l	nCa-mg/dl	nMg-mg/dl	Osmo.-mOsm/kg
Showtime	2	A	2	7.00	8.00	9.70	10.62	1.98	283.50
Showtime	2	A	3						
Showtime	2	A	4						
Showtime	3	B	1	2.00	15.00	8.45	10.53	4.26	351.50
Showtime	3	B	2	1.00	13.00	7.85	8.06	2.13	296.00
Showtime	3	B	3	1.00	19.00	8.45	11.28	1.98	392.50
Showtime	3	B	4	1.00	13.50	7.95	9.65	1.46	303.00
Showtime	4	C	1	0.50	21.50	6.00	15.66	4.10	370.00
Showtime	4	C	2	3.00	15.00	5.25	9.70	2.37	329.50
Showtime	4	C	3	4.00	15.00	6.15	11.26	2.10	329.00
Showtime	4	C	4	1.00	19.00	5.95	8.58	1.92	365.50
Sully	1	P	1	8.00	21.00	9.75	11.46	3.80	237.50
Sully	1	P	2	8.50	16.00	9.20	13.42	2.89	247.50
Sully	1	P	3	9.50	7.50	9.85	13.58	3.02	240.00
Sully	1	P	4	9.50	17.00	11.90	7.38	1.68	277.00
Sully	2	B	1	3.00	10.00	13.10	6.21	1.79	317.50
Sully	2	B	2						
Sully	2	B	3						
Sully	2	B	4						
Sully	3	C	1	8.50	7.50	7.45	11.06	3.58	347.00
Sully	3	C	2						
Sully	3	C	3						
Sully	3	C	4						
Sully	4	A	1	1.50	36.50	7.80	15.87	6.06	302.00
Sully	4	A	2	3.00	19.50	6.00	10.57	2.93	253.00
Sully	4	A	3	1.50	5.00	4.10	5.80	1.45	139.00
Sully	4	A	4	3.50	12.00	5.20	5.18	1.17	121.50
Vivo	1	P	1	7.50	19.00				258.50
Vivo	1	P	2	8.50	12.00	3.30	12.52	2.63	211.00
Vivo	1	P	3	5.00	9.00	5.80	9.57	1.87	165.00
Vivo	1	P	4	3.50	8.50	6.55	6.85	1.50	150.50
Vivo	2	A	1	6.00	18.00	8.90	22.99	4.30	292.00
Vivo	2	A	2	12.00	17.00	11.40	17.56	3.15	280.50
Vivo	2	A	3	9.50	16.50	10.50	18.70	3.00	284.50
Vivo	2	A	4	7.00	14.00	9.10	14.29	2.48	
Vivo	3	B	1	5.00	18.00	10.25	12.65	3.01	316.50
Vivo	3	B	2	3.50	15.00	8.20	9.57	1.92	254.00
Vivo	3	B	3	3.50	18.00	6.20	7.73	1.48	249.00
Vivo	3	B	4	5.50	26.50	6.45	6.65	1.05	288.00
Vivo	4	C	1	7.00	36.50	5.50	22.59	3.47	314.00
Vivo	4	C	2	5.00	6.50	3.50	7.23	2.06	261.50
Vivo	4	C	3	4.00	9.00	3.95	10.32	2.73	289.50
Vivo	4	C	4						

Horse	Diet	Period	Bout	pH	Na- mmol/l	K- mmol/l	Cl- mmol/l	Ca- mg/dl	Mg- mg/dl
Starlet	A	1	1	7.61	74	39.85	113.5	10.45	4.57
Starlet	A	1	2	7.65	67	40.25	104.5	10.46	4.21
Starlet	A	1	3	7.64					
Starlet	A	1	4	7.64					
Starlet	C	2	1	7.67	93	41.25	125	12.02	2.68
Starlet	C	2	2	7.78	94.5	38.95	125.5	10.47	1.84
Starlet	C	2	3	7.87	87	36.6	114	8.74	1.54
Starlet	C	2	4	7.90	95	68.45	122	7.40	1.19
Starlet	B	3	1	7.72	70.5	36.35	112	11.04	3.68
Starlet	B	3	2	7.70	79.5	41.15	121	10.60	3.10
Starlet	B	3	3	7.70	65	40.35	105.5	10.15	2.53
Starlet	B	3	4	7.70	64.5	45.15	109	8.97	2.06
Starlet	D	4	1	7.53	88.5	45.25	139	13.34	2.43
Starlet	D	4	2	7.69	82	35.55	117.5	9.18	1.36
Starlet	D	4	3	7.56	62.5	34.25	96.5	7.87	1.50
Starlet	D	4	4	7.64	75.5	40.05	113	7.35	1.36
Goliath	C	1	1	7.68	102	41.25	140.5	12.87	5.51
Goliath	C	1	2	7.72	95	42.95	134.5	11.93	3.42
Goliath	C	1	3	7.77	85	39.35	120.5	9.52	2.36
Goliath	C	1	4	7.89	93	38.2	122.5	7.20	1.54
Goliath	A	2	1	7.78	100.5	28	121.5	8.41	3.07
Goliath	A	2	2	7.88	92.5	30.25	111.5	8.85	1.83
Goliath	A	2	3	7.84	73.5	28.05	98	7.93	1.25
Goliath	A	2	4	8.17	90	30.25	111	8.13	0.98
Goliath	D	3	1	7.82	68.5	23.6	115	8.68	2.47
Goliath	D	3	2	7.80	83.5	27.4	109.5	6.69	1.82
Goliath	D	3	3	7.77	76	33.3	106	6.77	1.33
Goliath	D	3	4	7.72	73	32.8	101.5	4.84	0.90
Goliath	B	4	1	7.81	72	49.1	121	11.86	2.03
Goliath	B	4	2	7.78	70.5	45.3	113.5	9.64	2.36
Goliath	B	4	3	7.77	49.5	33.45	81	6.84	1.76
Goliath	B	4	4	7.79	61.5	42.05	101	6.99	1.58
Smagic	D	1	1	7.74	53.5	34.15	83	7.70	3.69
Smagic	D	1	2	7.75	58	40.55	94		2.76
Smagic	D	1	3	7.72	41.5	29.15	67.5	5.02	1.82
Smagic	D	1	4	7.69	30.5	21.45	28	3.30	1.29
Smagic	B	2	1	7.81	62.5	165.15	101.5	6.72	1.91
Smagic	B	2	2	7.86	81	45.75	120	6.44	1.76
Smagic	B	2	3	7.80	55.5	35.35	88	5.78	1.42
Smagic	B	2	4	7.90	56	43.65	93	5.70	1.23
Smagic	A	3	1	7.85	75.5	61.6	144	11.84	3.86
Smagic	A	3	2	7.64	54.5	44.9	100	7.43	2.06
Smagic	A	3	3						
Smagic	A	3	4						
Smagic	C	4	1	7.82	92	48.75	146	11.90	3.01
Smagic	C	4	2	7.63	68.5	44.15	118.5	8.10	1.85
Smagic	C	4	3						
Smagic	C	4	4	7.57	45.5	46.55	78	4.12	0.90

Horse	Diet	Period	Bout	pH	Na- mmol/l	K- mmol/l	Cl- mmol/l	Ca- mg/dl	Mg- mg/dl
Tank	B	1	1	7.82	87	58.65	139.5	13.66	4.73
Tank	B	1	2	7.96	85	56.4	133	11.65	3.22
Tank	B	1	3	7.86	75	65	131.5	11.83	2.53
Tank	B	1	4	7.84	71.5	51.8	113.5	7.11	1.33
Tank	C	2	1	7.84	97.5	48.5	134	9.17	2.07
Tank	C	2	2	7.81	102	44.65	132.5	5.77	1.20
Tank	C	2	3	7.83	92.5	46.6	129	4.41	0.84
Tank	C	2	4	7.92	103.5	45.85	134.5	2.50	0.44
Tank	A	3	1	7.73	76	50.55	127	12.56	2.23
Tank	A	3	2	7.80	60	34.4	90.5	7.95	1.40
Tank	A	3	3	7.75	49	29.2	77	4.82	0.87
Tank	A	3	4	7.88	70.5	26.4	101.5	2.55	0.58
Tank	D	4	1	7.83	104	44.55	143.5	9.36	2.51
Tank	D	4	2	7.79	107	41.75	138.5	6.36	1.42
Tank	D	4	3	7.82	107	41.9	138.5	6.06	1.10
Tank	D	4	4	7.83	108	48.05	144.5	5.07	0.89
Sassy	A	1	1	7.52	70	63.4	128	18.32	6.06
Sassy	A	1	2	7.67	86.5	53.05	131.5	13.54	3.84
Sassy	A	1	3	7.61	73.5	52.35	121.5	12.54	2.98
Sassy	A	1	4	7.73	90	54.55	136.5	11.35	2.22
Sassy	D	2	1	7.77	93.5	49.5	146.5	17.04	2.51
Sassy	D	2	2	7.81	88	52.05	138	14.18	1.89
Sassy	D	2	3	7.80	84.5	53.35	134.5	13.43	1.77
Sassy	D	2	4	7.83	98.5	44.85	133	9.43	1.19
Sassy	B	3	1	7.72	67	43.65	125	14.90	4.69
Sassy	B	3	2	7.76	75.5	46.8	125	12.84	3.24
Sassy	B	3	3	7.67	48	35.4	86	8.72	2.11
Sassy	B	3	4	7.73	69.5	52.3	126	10.98	2.07
Sassy	C	4	1	7.50	85.5	55.55	145.5	16.05	5.21
Sassy	C	4	2	7.62	88.5	49.65	137.5	12.26	2.86
Sassy	C	4	3	7.63	64	45.25	110	10.08	2.75
Sassy	C	4	4	7.66	79.5	48.05	125	8.99	2.08
Stimpy	D	1	1	7.64	72	42.5	112.5	11.17	4.05
Stimpy	D	1	2	7.66	73	44.45	115.5	10.29	2.84
Stimpy	D	1	3	7.63	50	34.75	85	7.67	2.10
Stimpy	D	1	4	7.64	65.5	49.65	113	8.72	2.31
Stimpy	B	2	1						
Stimpy	B	2	2						
Stimpy	B	2	3						
Stimpy	B	2	4						
Stimpy	C	3	1	7.75	78	40.95	132	12.09	3.49
Stimpy	C	3	2	7.74	71	38.85	111.5	9.89	2.19
Stimpy	C	3	3	7.66	57	36.55	94.5	8.36	1.76
Stimpy	C	3	4	7.68	66.5	40.85	108.5	7.98	1.59
Stimpy	A	4	1	7.64	57.5	41.25	120.5	10.56	5.10
Stimpy	A	4	2	7.68	60.5	54.4	116	10.07	3.44
Stimpy	A	4	3	7.68	65.5	56.1	120	10.07	2.85
Stimpy	A	4	4	7.75	81	53.65	134.5	10.53	2.53

Horse	Diet	Per.	Bout	pH	Gluc-mg/dl	BUN-mg/dl	HCO3-mmol/l	nCa-mg/dl	nMg-mg/dl	Osmo-mosm/l
Starlet	A	1	1	7.61	0.5	4.5	7.5	11.76	4.87	148.5
Starlet	A	1	2	7.65	0.5	2	6.05	12.00	4.53	134
Starlet	A	1	3	7.64						
Starlet	A	1	4	7.64						
Starlet	C	2	1	7.67	19.5	15	10.75	13.97	2.91	188.5
Starlet	C	2	2	7.78	0	11.5	8.55	12.86	2.06	188.5
Starlet	C	2	3	7.87	2	10	7.15	11.18	1.78	174.5
Starlet	C	2	4	7.90	1.5	11	7.3	9.61	1.38	189.5
Starlet	B	3	1	7.72	1	18	6.95	13.12	4.05	146.5
Starlet	B	3	2	7.70	4.5	16	7.7	12.48	3.39	162.5
Starlet	B	3	3	7.70	0.5	9.5	5.4	11.96	2.77	133
Starlet	B	3	4	7.70	0	9	5.15	10.54	2.25	131.5
Starlet	D	4	1	7.53	1.5	25.5	9.05	14.35	2.53	182.5
Starlet	D	4	2	7.69	2	11	5.7	10.75	1.48	166
Starlet	D	4	3	7.56	2	5.5	6.1	8.59	4.58	126.5
Starlet	D	4	4	7.64	4	7.5	6.3	8.37	1.45	153
Goliath	C	1	1	7.68	0.5	11	8.25	15.02	6.00	203
Goliath	C	1	2	7.72	0	8.5	7.15	14.21	3.76	188.5
Goliath	C	1	3	7.77	0	8.5	5.35	11.60	2.63	170.5
Goliath	C	1	4	7.89	0	9.5	5.6	9.26	1.78	185.5
Goliath	A	2	1	7.78	10	11.5	9.75	10.31	3.44	200.5
Goliath	A	2	2	7.88	12.5	10	8.3	11.38	2.11	185.5
Goliath	A	2	3	7.84	11.5	8	7.6	9.97	1.42	150
Goliath	A	2	4	8.17	10	10	8.2			180.5
Goliath	D	3	1	7.82	0.5	19	6.2	10.83	2.80	173.5
Goliath	D	3	2	7.80	0	11.5	6.75	8.27	2.06	168
Goliath	D	3	3	7.77	0.5	9.5	5.4	8.23	1.48	154
Goliath	D	3	4	7.72	0.5	8.5	5.3	5.74	0.99	148
Goliath	B	4	1	7.81	4	8	6.35	14.80	2.30	146.5
Goliath	B	4	2	7.78	3	5	5.9	11.79	2.64	142
Goliath	B	4	3	7.77	2	2.5	5.1	8.31	1.96	101
Goliath	B	4	4	7.79	2.5	3.5	5	8.59	1.77	125
Smagic	D	1	1	7.74	0.5	1.5	5.6	9.23	4.08	108
Smagic	D	1	2	7.75	0	1.5	4.75	9.06	3.10	118
Smagic	D	1	3	7.72	0	1	4.1	5.96	2.00	86
Smagic	D	1	4	7.69	0	0	3.35	3.85	1.41	65
Smagic	B	2	1	7.81	3	12.5	6.45	8.34	2.16	129
Smagic	B	2	2	7.86	3.5	10	6.7	8.19	2.03	163
Smagic	B	2	3	7.80	6.5	6	6.65	7.14	1.60	114
Smagic	B	2	4	7.90	6	4.5	6.15	7.35	1.43	115
Smagic	A	3	1	7.85	0.5	29.5	7.45	15.05	4.42	159.5
Smagic	A	3	2	7.64	0.5	9.5	5.65	8.50	2.22	113
Smagic	A	3	3							
Smagic	A	3	4							
Smagic	C	4	1	7.82	1.5	19	7.1	14.92	3.41	187.5
Smagic	C	4	2	7.63	2	7	5.25	9.20	1.98	138.5
Smagic	C	4	3							
Smagic	C	4	4	7.57						

Horse	Diet	Per.	Bout	pH	Gluc- mg/dl	BUN- mg/dl	HCO3- mmol/l	nCa- mg/dl	nMg- mg/dl	Osmo- mosm/l
Tank	B	1	1	7.82	0	7.5	7.4	17.16	5.37	173
Tank	B	1	2	7.96	0.5	6	5.75	15.67	3.81	169
Tank	B	1	3	7.86	0	3.5	4.9	15.14	2.91	149.5
Tank	B	1	4	7.84	0	2	4.95	8.94	1.52	142.5
Tank	C	2	1	7.84	1	14.5	10.3	11.56	2.36	195.5
Tank	C	2	2	7.81	1.5	11.5	9.3	7.13	1.36	203
Tank	C	2	3	7.83	1	9.5	7.5	5.48	0.95	184.5
Tank	C	2	4	7.92	1.5	10	8.05	3.16	0.51	204.5
Tank	A	3	1	7.73	4.5	12.5	8	14.99	2.46	155
Tank	A	3	2	7.80	2.5	8	6.1	9.83	1.57	123
Tank	A	3	3	7.75	0	6	4.8	5.85	0.97	102.5
Tank	A	3	4	7.88	0.5	17.5	5.55	3.18	0.67	146.5
Tank	D	4	1	7.83	6.5	14	7.25	11.79	2.86	207.5
Tank	D	4	2	7.79	4.5	12	7.45	7.80	0.80	212.5
Tank	D	4	3	7.82	3	13	7.25	7.54	1.25	213
Tank	D	4	4	7.83	6.5	12	6.55	6.33	1.01	214.5
Sassy	A	1	1	7.52	2	15	8.1	19.58	6.28	145
Sassy	A	1	2	7.67	0	13	7.15	15.69	4.15	174
Sassy	A	1	3	7.61	1	10	6.9	14.08	3.17	149.5
Sassy	A	1	4	7.73	0	11	7.25	13.54	2.45	180
Sassy	D	2	1	7.77	3	39	10.35	20.78	2.80	197.5
Sassy	D	2	2	7.81	1.5	22.5	9	17.67	2.13	181.5
Sassy	D	2	3	7.80	0	20.5	9.15	16.65	2.00	173.5
Sassy	D	2	4	7.83	0.5	17.5	11.12	6.51	1.28	198
Sassy	B	3	1	7.72	2	30	5.8	17.75	5.18	144.5
Sassy	B	3	2	7.76	1	18	6.7	15.58	3.60	150.5
Sassy	B	3	3	7.67	1	9	4.85	10.09	2.29	101.5
Sassy	B	3	4	7.73	2.5	21	6.6	13.10	2.28	145.5
Sassy	C	4	1	7.50	1	15.5	9.45	16.94	5.38	173
Sassy	C	4	2	7.62	5	11	7.95	13.89	3.05	177.5
Sassy	C	4	3	7.63	4.5	8	5.8	11.45	2.95	131.5
Sassy	C	4	4	7.66	4	10	6.1	10.43	2.25	160
Stimpy	D	1	1	7.64	0	13.5	5.95	12.76	4.35	147.5
Stimpy	D	1	2	7.66	3.5	14	5.45	11.86	3.07	149
Stimpy	D	1	3	7.63	0	8	3.9	8.68	2.25	105
Stimpy	D	1	4	7.64	0		4.25	9.94	2.48	
Stimpy	B	2	1							
Stimpy	B	2	2							
Stimpy	B	2	3							
Stimpy	B	2	4							
Stimpy	C	3	1	7.75	3.5	28.5	5.75	14.62	3.88	164.5
Stimpy	C	3	2	7.74	1.5	12.5	5.25	11.87	2.42	145.5
Stimpy	C	3	3	7.66	0.5	9	4.95	9.64	1.90	118.5
Stimpy	C	3	4	7.68	1	12.5	4.8	9.27	1.72	137.5
Stimpy	A	4	1	7.64	4.5	19	4.7	12.08	5.48	123
Stimpy	A	4	2	7.68	6	7	4.4	11.72	3.74	125
Stimpy	A	4	3	7.68	7.5	7	4.55	11.71	3.10	134
Stimpy	A	4	4	7.75	2.5	8.5	5.65	12.71	2.81	163

VITA

Holly Sue Spooner is the daughter of Charles and Kathy Kenimond and was born on May 14, 1981 in Kokomo, IN. On August 21, 2004 she married Scott Spooner.

Following graduation from Carroll Jr./Sr. High School in Flora, IN, Holly attended Texas A&M University where she was a National Merit and Presidential Endowed Scholar. In 2003 she completed her B.S. in Agricultural Development, graduating magna cum laude. Holly began graduate school at Texas A&M University as a Regent's fellow in August of 2003 and completed her M.S. in Animal Science (equine nutrition) in August, 2005. Holly initiated her doctoral studies in Animal Science (equine nutrition and exercise physiology) as a University Distinguished Fellow at Michigan State University in August, 2005. Throughout her graduate career, she has been involved in research in equine nutrition and equine exercise physiology, and her work has been published in the Journal of Animal Physiology and Animal Nutrition, Journal of Comparative Exercise Physiology, and the Journal of Equine Veterinary Science. While at Texas A&M and Michigan State, Holly served as a research and teaching assistant.

Upon completion of her PhD, Holly has accepted a position as an Assistant Professor and Extension Horse Specialist within the Davis College of Agriculutre, Forestry, and Consumer Science at West Virginia University in Morgantown, WV. Holly remains active in the horse industry, judging, exhibiting, and instructing. Holly Sue Spooner's permanent address is PO Box 415, Arthurdale, WV, 26520.

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