10.22059/IJVM.2022.332703.1005201

Iranian Journal of Veterinary Medicine
Volume 16- Issue 3

Original Article
Online ISSN: 2252-0554

Prevalence of Obesity and Equine Metabolic Syndrome Among Grazing and Non-Grazing Horses

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Abstract

BACKGROUND: Obesity is a major problem in horses, unfortunately many times underrated by owners. Equine metabolic syndrome (EMS) is one of the obesity complications that can cause laminitis, hypertension, subfertility, and so on. Insulin dysregulation (ID) is the main feature of EMS that results from insulin resistance.

OBJECTIVES: The aim of this study was to evaluate the role of feeding management in obesity and EMS occurrence.

METHODS: Five hundred seventy horses were evaluated in this study. They were divided into the groups based on age, gender, breed, exercise activity, and feeding type. Glucose and insulin were measured using an AutoAnalyzer device and ELISA kit, respectively.

RESULTS: Out of 570 horses, 2% had EMS while 14% were fat but obesity occurrence was higher in horses grazed in pasture (25%) compared to the horses that had not access to pasture (9%).

CONCLUSIONS: Results showed that prevalence of EMS under different feeding strategies is significantly different. For the prevention of this important welfare issue, feeding management and routine exercise are the best ways.

KEYWORDS: EMS, Exercise, Feeding, Horse, Obesity, Prevention

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Received: 2021-12-06

Accepted: 2022-03-04

How to Cite This Article

Nikjooy, N ., Asghari, A., Hassanpour, Sh., Arfaee, F. (2022). Study of Anti-nociceptive Role of the *Manna of Hedysarum* and the neurotransmitter systems involved in Mice. *Iranian Journal of Veterinary Medicine, 16*(3), 249-256.

Introduction

Obesity is a big challenge in horses' welfare. Obese horses are predisposed to some metabolic disorders such as equine metabolic syndrome (EMS), which consequently results in laminitis, subfertility, and hyperlipidemia. Obesity may also cause osteoarthritis and hypertension (McCue *et al*., 2015). Obesity is an issue that is neglected by owners sometimes. High prevalence of obesity has been reported in the UK (Robin *et al*., 2015). In the United States, 51% of light breed (Thatcher *et al*., 2012) and 24% of Australian pleasure horses are fat (Potter *et al*., 2016). Obesity is determined by body condition scoring; for example in Henneke scoring system, the body condition score (BCS) above 7 is assumed fat (Henneke *et al*., 1983). Some horses have regional fat accumulation (regional adiposity), most commonly in their nuchal ligament region (cresty neck), tailhead, and preputial or mammary gland region. BCS ≥7/9 (Henneke scoring system) and cresty neck score ≥3 (Carter *et al*., 2009) are two main features of obese horses.

EMS is a set of clinical features and a risk factor for endocrinopathic laminitis (Durham *et al*., 2019). EMS occurs as a result of over-nutrition, exercise limitation, and, consequently, obesity (McGowan *et al*. 2013). The main feature of EMS is insulin dysregulation (ID) (Durham *et al*., 2019), which is characterized by hyperinsulinemia. Other manifestations of this syndrome with variable occurrences are: hypertriglyceridemia, hyperleptinemia, arterial hypertension, altered reproductive cycling in mare, and increased systemic inflammation response (Durham *et al*., 2019). ID is the core feature of pathophysiological events in EMS. Hyperinsulinemia appears after insulin resistance and is a trigger for other manifestations.

There are two hypotheses linking obesity to insulin resistance (IR): first, adipokines and cytokines of adipose tissue that downregulate the insulin signaling pathway; second, the accumulation of intracellular lipids in tissue (lipotoxicity). Because of intracellular accumulation of lipid in the liver of obese horses impairment of insulin clearance is another possible factor that results in hyperinsulinemia in EMS horses (Potter *et al*., 2016).

It is not well documented how hyperinsulinemia causes laminitis. Nonetheless, endothelial dysfunction and digital vasoconstriction (Fitzgerald *et al., 2019*) play major roles. Insulin is a double-edged sword; it normally causes vasodilation by the synthesis of nitric oxide (NO) (Muniyappa *et al*., 2008). On the other hand, by the activation of sympathetic pathways through endothelin-1 (ET-1), vasoconstriction is induced (Muniyappa *et al*., 2008). In IR (Insulin Resistance) human, it has been found that NO synthesis is impaired, and in contrast, ET-1 synthesis is increased as a compensatory mechanism for hyperinsulinemia.

Current knowledge for the management of EMS horses includes physical activity, dietary restriction, and medical management of hyperinsulinemia. Owners should be aware that control of EMS is much easier than treatment, so the balance ratio and exercise are the main approaches (Marycz *et al*., 2018).

It has been shown that removal of horses from pasture, limitation of forage, and soaking of forage in water can help obese horses lose weight. EMS horses should be fed with 1-1.5% of BW of hay with a non-structural carbohydrate (NSC) content of ≤10%, or alternatively, long time soaking (8-16 hours) can reduce NSC (McGowan *et al*., 2013).

This study aimed to evaluate the prevalence of obesity and EMS among Iranian horses and also evaluate the role of feeding management and exercise in occurrence of obesity and EMS. Till now all of the studies have been done in countries with similar management policies based on pasture feeding. We assumed that in Iran with different management styles, the prevalence of EMS could be different. Moreover, the authors did the study in three provinces with different pasture access to better evaluate the roles of feeding management in EMS occurrence.

Materials and Methods

Ethical approval was obtained from the University of Tehran Research Council. The study was performed on 570 horses aged 3-18 years, which were divided into two categories, including 3-10 years and 11-18 years. One hundred and ninety horses were

grazed in pasture, while 380 horses were fed indoors and did not have access to pasture. Three hundred fifty-two mares, including 146 pregnant (first 186 days of pregnancy) and 206 non-pregnant, as well as 218 male horses, including 209 geldings and 9 stallions, were considered for this study. The study was done during the spring and summer of 2020 in three provinces, including Tehran, Alborz, and Golestan. The overweight horses with BCS ≥7 (Henneke scale) or horses with local adiposity such as cresty neck ≥3 (Carter's score) were identified by observation. Each horse was asked to walk and trot to evaluate its lameness. Lame horses were clinically examined to confirm their laminitis. Given the effect of stress on endocortical axis, we tried to separate the horses from stressful situations before sampling. In this regard, horses with recent transportation or any environmental stress were excluded from the study.

Horses with obesity criteria and horses with laminitis at the initial visit or with a history of endocrinopathic laminitis were included in the study even if their BCSs were under 7. Based on their premises and ration, horses were classified as grazing and non-grazing.

EMS horses were defined as horses with plasma insulin concentrations higher than 20 µIU/mL.

In obese horses, blood samples were taken in the morning before feeding (6-8 hours off-feed). The blood sample was collected in a plain and EDTA evacuated tube to measure insulin and blood glucose levels. The samples were sent as whole blood to the laboratory. The blood samples were placed in ice, and processing was done in the laboratory for more evaluation. Centrifugation was done for 10 minutes at 3000 g. Glucose and insulin were measured. Glucose was measured using the AutoAnalyzer device.

All of the harvested plasma samples of all individual horses were tested using a horse-specific ELISA kit (Hangzhou EastBiopharm Co. LTD., China) for the measurement of plasma concentrations of insulin. The light absorption of microwells was read by an ELISA plate reader device (Biotech ELX, USA) at 450 nm wavelength. Based on the light absorption of standard microwells, standard curves were drawn for each peptide. Then, using these standard curves, the concentration of insulin was determined.

Statistical Analysis

Chi-square test and Fisher's exact test were conducted to compare the frequencies of surveyed factors between the obese and non-obese and also between the obese horses affected by EMS and those not affected by this condition. SPSS software version 20.0 (SPSS Inc., Chicago, IL., USA) was used to perform statistical analysis, and P-value<0.05 was considered statistically significant.

Results

As abovementioned, horses were divided into two categories based on age, including 3-10 years and 11-18 years. Hence, 53 out of 347 horses (3-10 years) and 29 out of 223 (11-18 years) were fat. Moreover, 7 and 6 horses had EMS at 3-10 years old and 11-18 years, respectively (Table 1). There was no significant correlation between age and obesity or EMS occurrence.

Among the 352 mares, 67 were fat, and 11 had EMS. Furthermore, out of 218 males, 15 were fat, and 2 had EMS (Tables 2 and 3). Gender significantly affected obesity, but there was no correlation with EMS occurrence.

There were 3 breeds in this study, including Turkman (117), Thoroughbred (73), and warm-blood (380). Since the feeding strategies were the same for Turkman and Thoroughbred horses, and also for better analysis of data, the authors considered both breeds as one category named light-saddlebred. They were kept in studs which were located in the same area with access to pasture. Forty-eight light saddlebred and 34 warm-blood horses were fat; 8 and 5 of them had EMS, respectively. Breed had a significant correlation with obesity, but authors believed this correlation was more affected by feeding strategies since, as mentioned, light-saddlebred horses had access to pasture grazing while warm-blood ones were fed indoors.

In this study, 485 horses had routine physical activity; either professional training or day long walking (at least 20 min), and trotting on the lunge. Eighty five horses rarely worked and only spent a long time in the stall. Moreover, 54 and 28 horses were fat in both groups, respectively (Table 2). Six horses with physical activity and 7 with sedentary behavior had EMS (Table 3).

Table 1. The frequency and number of horses in each variable

	Category	All horses (n=570)	%
BCS	<7 (normal or under-weight)	488	85.6
	≥7 (obese)	82	14.4
Age	3-10	347	60.9
	10-18	223	39.1
Gender	Female	352	61.7
	Male	218	38.3
Breed	Warm-blood	380	66.7
	Light saddlebred	190	33.3
Exercise	Routine	485	85.1
	Rarely	85	14.9
Feeding style	Grazing	190	33.3
	Non-grazing	380	66.7

Among 570 horses, 82 were defined as fat (BCS≥7 and/or CN≥3; 14%); among the horses with pasture access, 48 were fat (25%), while in the group which did not graze, 34 horses were fat (9%). The prevalence of obesity in the total population was 14% (84/570). Obesity had a significant correlation with feeding management (Table 2). Nine out of 48 obese horses grazed on pasture had EMS (18%); while in indoor feeding, 4 out of 34 obese horses had EMS (12%). In general, 13 out of 570 horses had EMS (2.5%) in this study. It means the prevalence of EMS among obese horses was 16% (13/82). EMS occurrence did not have a significant correlation with feeding strategy (Table 3).

Table 2. Frequencies of studied variables in all horses differing in obesity

	Obese horses no. (%)	Non-obese horses no.(%)
BCS *		
<7	0(0)	488(100)
≥7	82(100)	0(0)
Age		
3-10 years old	53(15.3)	294(84.7)
11-18 years old	29(13)	194(87)
Gender *		
Female	67(19)	285(81)
Male	15(6.9)	203(93.1)
Breed *		
Warmblood	34(8.9)	346(91.1)
Light saddlebred	48(25.3)	142(74.7)
Exercise *		
Routine	54(11.1)	431(88.9)
Rarely	28(32.9)	57(67.1)
Feeding style *		
Grazing	48(25.3)	142(74.7)
Non-grazing	34(8.9)	346(91.1)

*Significant difference between obese and non-obese horses (P<0.05)

Table 3. Frequencies of studied variables in obese horses differing in metabolic status

	Affected by EMS no. (%)	Not affected by EMS no. (%)
BCS *		
<7	0(0)	69(100)
≥7	13(100)	0(0)
Age		
3-10 years old	7(13.2)	46(86.8)
11-18 years old	6(20.7)	23(79.3)
Gender		
Female	11(16.4)	56(83.6)
Male	2(13.3)	13(86.7)
Breed		
Warmblood	5(14.7)	29(85.3)
Light saddlebred	8(16.7)	40(83.3)
Exercise		
Routine	6(11.1%)	48(88.9)
Rarely	7(25)	21(75)
Feeding style *		
Grazing	9(18.8)	39(81.2)
Non-grazing	4(11.8)	30(88.2)

*Significant difference between EMS and non-EMS horses ($P<0.05$)

Discussion

ID is the core and main feature of EMS (Carslake *et al*., 2021). An increase in plasma insulin level is the main laboratory indicator of a suspected case of EMS. In some studies, very variable results have been reported for the prevalence of EMS (Pleasant *et al*., 2013; Morgan *et al*., 2014; Carslake *et al*., 2021). This difference in results is probably due to the effect of different criteria such as the cutoff value of insulin, breeds of the studied population, and methods of insulin evaluation. Walsh and colleagues (Walsh *et al*., 2009) used 70 IU/mL as a cutoff value, while Carslake (Carslake *et al*., 2021) and Morgan (Morgan *et al*., 2014) used 20 IU/mL. Pleasant (Pleasant *et al*., 2013) studied light-bred horses in the United States, while Carslake (Carslake *et al*., 2021) and Morgan (Morgan *et al*., 2014) worked on ponies. In the present study, we considered the 20 IU/mL plasma insulin concentration as the criterion, and light-saddlebred and warm-blood horses were sampled.

We reported a much lower prevalence of EMS (2.5%). We believe this low prevalence is the effect of feeding management on warm-blood horses. The prevalence of EMS in light-saddlebred horses was 4.2% (8/190); in warm-blood ones, it was 1.3% (5/380).

In horses grazed on pasture, EMS prevalence was 4.7% (9/190) compared to 1% (4/380) in indoor horses. Carslake and colleagues reported a relationship between the increasing age and the occurrence of EMS (Carslake *et al*., 2021). This relationship was previously reported by Morgan (Morgan *et al*., 2014). In this study, no correlation was found between the EMS occurrence and obesity in different age groups and gender, while obesity was affected by both. The study of Carslake *et al.* was the first one to show a gender effect on EMS occurrence, with mare at a higher percentage than gelding and stallion. These authors did not find any significant effect of pregnancy on EMS occurrence.

This study strongly supported the correlation between obesity and EMS occurrence. The prevalence of EMS in obese horses was 16% versus 0% in normal or underweight horses, as well as supporting the results of other studies (Heliczer *et al*., 2017., Durham *et al*., 2019., Fitzgerald *et al*., 2019.,

Carslake *et al*., 2021). Vick *et al.* showed an inverse relationship between the BCS and insulin sensitivity. They also found a positive relationship between adiposity and an increase in inflammatory markers (Vick *et al*., 2006). This relationship could be explained by the anti-inflammatory property and insulin sensitivity of adiponectin. In the study of Zak *et al.*, no relationship was found between the obesity, ID, and the occurrence of low-grade, chronic inflammation in the horses with EMS (Zak *et al*., 2020).

Another study had anecdotal results; Carter *et al.* concluded that weight gain in horses simultaneously occurred with diminishing insulin sensitivity. Thirteen geldings were overfed for 16 weeks, causing an increase in their BCS from 6/9 to 8/9. In their study, obesity resulted in hyperinsulinemia and hyperleptinemia (Carter *et al*., 2009).

Insulin sensitivity was unchanged in thoroughbred geldings fed high fat and fiber diet, while in a group of horses fed a diet high in starch and sugar, insulin sensitivity was decreased. The authors concluded that dietary energy sources are more determinative than weight gain (Quinn *et al*., 2008).

Decreased pasture time in summer was a risk factor in one study (Carslake *et al*., 2021), the result of which is in contrast with our results. We found a strong relationship between grazing on pasture, obesity, and EMS occurrence. As Quinn *et al.* (2008) stated, a high-sugar diet causes insulin resistance. Pasture is mostly high in sugar, starch, and fructan, especially in the growing season. High NSC in a fresh pasture is associated with obesity and laminitis (Reynolds *et al*., 2019).

Conclusion

This study concluded that the most crucial factor in obesity and EMS incidence is feeding management, and diets with high NSC are the most critical risk factors.

Our results, in summary, show that gender, breed, sedentary lifestyle, and feeding management could affect the obesity in horses. In contrast, feeding management is the key factor for EMS occurrence among fat horses. We concluded that in the same group of horses or ponies, factors such as breed, age, sex, and are not as important as diet. Therefore, the best way to control EMS is to appeal to an appropriate ration management system.

Acknowledgments

The author gratefully acknowledged the owners who cooperated in this study and gave the data to the authors accurately. The authors supported the study financially.

Conflict of Interest

The author of this study have no financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the study.

References

Carslake, H. B., Pinchbeck, G. L., & McGowan, C. M. (2021). Equine metabolic syndrome in UK native ponies and cobs is highly prevalent with modifiable risk factors. *Equine Veterinary Journal*, *53*(5), 923-934. [DOI:10.1111/evj.13378] [PMID] [PMCID]

Carter, R. A., Geor, R. J., Staniar, W. B., Cubitt, T. A., & Harris, P. A. (2009). Apparent adiposity assessed by standardised scoring systems and morphometric measurements in horses and ponies. *The Veterinary Journal*, *179*(2), 204-210. [DOI:10.1016/j.tvjl.2008.02.029] [PMID]

Durham, A. E., Frank, N., McGowan, C. M., Menzies-Gow, N. J., Roelfsema, E., Vervuert, I., ... & Fey, K. (2019). ECEIM consensus statement on equine metabolic syndrome. *Journal of Veterinary Internal Medicine*, *33*(2), 335-349. [DOI:10.1111/jvim.15423] [PMID] [PMCID]

Fitzgerald, D. M., Anderson, S. T., Sillence, M. N., & de Laat, M. A. (2019). The cresty neck score is an independent predictor of insulin dysregulation in ponies. *PLoS One*, *14*(7), e0220203. [DOI:10.1371/journal.pone.0220203]

Heliczer, N., Gerber, V., Bruckmaier, R., van der Kolk, J. H., & de Solis, C. N. (2017). Cardiovascular findings in ponies with equine metabolic syndrome. *Journal of the American Veterinary Medical Association*, *250*(9), 1027-1035. [DOI:10.2460/javma.250.9.1027] [PMID]

Henneke, D. R., Potter, G. D., Kreider, J. L., & Yeates, B. F. (1983). Relationship between condition score, physical measurements and body fat percentage in mares. *Equine Veterinary Journal*, *15*(4), 371-372. [DOI:10.1111/j.2042-3306.1983.tb01826.x] [PMID]

Marycz, K., Michalak, I., & Kornicka, K. (2018). Advanced nutritional and stem cells approaches to prevent equine metabolic syndrome. *Research in Veterinary Science*, *118*, 115-125. [DOI:10.1016/j.rvsc.2018.01.015] [PMID]

McCue, M. E., Geor, R. J., & Schultz, N. (2015). Equine metabolic syndrome: a complex disease influenced by genetics and the environment. *Journal of Equine Veterinary Science*, *35*(5), 367-375. [DOI:10.1016/j.jevs.2015.03.004]

McGowan, C. M., Dugdale, A. H., Pinchbeck, G. L., & Argo, C. M. (2013). Dietary restriction in combination with a nutraceutical supplement for the management of equine metabolic syndrome in horses. *The Veterinary Journal*, *196*(2), 153-159. [DOI:10.1016/j.tvjl.2012.10.007] [PMID]

Morgan, R. A., McGowan, T. W., & McGowan, C. M. (2014). Prevalence and risk factors for hyperinsulinaemia in ponies in Q ueensland, A ustralia. *Australian Veterinary Journal*, *92*(4), 101-106. [DOI:10.1111/avj.12159] [PMID]

Muniyappa, R., Iantorno, M., & Quon, M. J. (2008). An integrated view of insulin resistance and endothelial dysfunction. *Endocrinology and Metabolism Clinics of North America*, *37*(3), 685-711. [DOI:10.1016/j.ecl.2008.06.001] [PMID] [PMCID]

Pleasant, R. S., Suagee, J. K., Thatcher, C. D., Elvinger, F., & Geor, R. J. (2013). Adiposity, plasma insulin, leptin, lipids, and oxidative stress in mature light breed horses. *Journal of Veterinary Internal Medicine*, *27*(3), 576-582. [DOI:10.1111/jvim.12056] [PMID]

Potter, S. J., Bamford, N. J., Harris, P. A., & Bailey, S. R. (2016). Prevalence of obesity and owners' perceptions of body condition in pleasure horses and ponies in south-eastern Australia. *Australian Veterinary Journal*, *94*(11), 427-432. [DOI:10.1111/avj.12506] [PMID]

Quinn, R. W., Burk, A. O., Hartsock, T. G., Petersen, E. D., Whitley, N. C., Treiber, K. H., & Boston, R. C. (2008). Insulin sensitivity in Thoroughbred geldings: effect of weight gain, diet, and exercise on insulin sensitivity in Thoroughbred geldings. *Journal of Equine Veterinary Science*, *28*(12), 728-738. [DOI:10.1016/j.jevs.2008.10.020]

Reynolds, A., Keen, J. A., Fordham, T., & Morgan, R. A. (2019). Adipose tissue dysfunction in obese horses with equine metabolic syndrome. *Equine Veterinary Journal*, *51*(6), 760-766. [DOI:10.1111/evj.13097] [PMID] [PMCID]

Robin, C. A., Ireland, J. L., Wylie, C. E., Collins, S. N., Verheyen, K. L. P., & Newton, J. R. (2015). Prevalence of and risk factors for equine obesity in G reat B ritain based on owner-reported body condition scores. *Equine Veterinary Journal*, *47*(2), 196-201. [DOI:10.1111/evj.12275] [PMID]

Thatcher, C. D., Pleasant, R. S., Geor, R. J., & Elvinger, F. (2012). Prevalence of overconditioning in mature horses in southwest Virginia during the summer. *Journal of Veterinary Internal Medicine*, *26*(6), 1413-1418. [DOI:10.1111/j.1939-1676.2012.00995.x] [PMID]

Vick, M. M., Sessions, D. R., Murphy, B. A., Kennedy, E. L., Reedy, S. E., & Fitzgerald, B. P. (2006). Obesity is associated with altered metabolic and reproductive activity in the mare: effects of metformin on insulin sensitivity and reproductive cyclicity. *Reproduction, Fertility and Development*, *18*(6), 609-617. [DOI:10.1071/RD06016] [PMID]

Walsh, D. M., McGowan, C. M., McGowan, T., Lamb, S. V., Schanbacher, B. J., & Place, N. J. (2009). Correlation of plasma insulin concentration with laminitis score in a field study of equine Cushing's disease and equine metabolic syndrome. *Journal of Equine Veterinary Science*, *29*(2), 87-94. [DOI:10.1016/j.jevs.2008.12.006]

Zak, A., Siwinska, N., Elzinga, S., Barker, V. D., Stefaniak, T., Schanbacher, B. J., ... & Adams, A. A. (2020). Effects of equine metabolic syndrome on inflammation and acute-phase markers in horses. *Domestic Animal Endocrinology*, *72*, 106448. [DOI:10.1016/j.domaniend.2020.106448] [PMID].

10.22059/IJVM.2022.332703.1005201

Iranian Journal of Veterinary Medicine

Abstracts in Persian Language

Online ISSN 2252-0554

مجله طب دامی ایران، ۱۴۰۱، دوره ۱۶، شماره ۳، ۲۴۹-۲۵۶

شیوع چاقی و سندرم متابولیک اسبان بین اسب های با تغذیه مرتعی و غیر مرتعی

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(دریافت مقاله: ۱۵ آذر ماه ۱۴۰۰، پذیرش نهایی: ۱۳ اسفند ۱۴۰۰)

زمینه مطالعه: چاقی یک چالش مهم در پرورش اسب‌ها است که متأسفانه توسط مالکین دست کم گرفته می‌شود. سندرم متابولیک اسب (EMS) یکی از عوارض چاقی است که می‌تواند باعث لامینیتیس، فشار خون بالا، ناباروری و غیره شود. اختلال در تنظیم انسولین (ID) ویژگی اصلی EMS است که از مقاومت به انسولین ناشی می‌شود.

هدف: هدف از این مطالعه بررسی نقش مدیریت تغذیه در چاقی و بروزEMS است.

روش کار: در این مطالعه ۵۷۰ اسب بررسی شدند. آنها بر اساس سن، جنس، نژاد، فعالیت ورزشی و نوع تغذیه به گروه‌هایی تقسیم می‌شوند.

نتایج: ۲ درصد از ۵۷۰ اسب EMS داشتند و ۱۴ درصد چاق بودند، اما بروز چاقی در اسب‌هایی که در مرتع چرا می‌کردند (۲۵ درصد) در مقایسه با اسب‌هایی که دسترسی به چرا نداشتند (۹ درصد) بیشتر بود.

نتیجه‌گیری نهایی: نهایی: نتایج نشان داد که شیوع EMS در مدیریت‌های مختلف تغذیه تفاوت معنی‌داری دارد. برای پیشگیری از این موضوع مهم مدیریتی، مدیریت تغذیه و ورزش روزمره بهترین راهکار است.

واژه‌های کلیدی: اسب، EMS، ورزش؛ تغذیه، پیش‌گیری، چاقی

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