DENTAL EXAMINATION FINDINGS IN TWO GROUPS OF LITHUANIAN HORSES WITH NO HISTORY OF DENTAL PROPHYLAXIS OR TREATMENT

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Summary. The purpose of this study was to report the results of clinical examination of the teeth in the ancient Žemaitukai horses and to compare these findings with the results of the Lithuanian heavy-drought horses. In total, fifty−one Žemaitukai horses had a complete dental examination. This is likely the first time dental examinations were performed in these horses. Clinical examination of the teeth of the horses was made to initiate their health care management. A Triadan tooth numbering system was used in order to document the findings and to analyse the results (Foster, 1996; Easley, 1999a).

The main dental finds were sharp enamel points on maxillary and mandibular cheek teeth, rostral hooks, and wave mouth. Dental abnormalities in Žemaitukai horses (65) were found 1.6 times less compared with Lithuanian heavy-drought horses (107). The results of this research suggest that it is purposeful to continue dental research for the whole population of Žemaitukai horses and Lithuanian heavy-drought horses as a part of their health-care program. This is important for the welfare of the horses and for keeping and sustaining these national Lithuanian breeds.

Key words: dentistry, Žemaitukai, Lithuanian heavy-drought horses.

DVIEJŲ LIETUVOS ARKLIŲ VEISLIŲ DANTŲ TYRIMO DUOMENYS IR JŲ PALYGINIMAS

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Santrauka. Šio tyrimo tikslas – pristatyti klinikinio senosios žemaitukų veislės arklių dantų būklės tyrimo rezultatus ir palyginti juos su K. Maslausko ir kitų tyrėjų (2008) publikuotais klinikinio nacionalinės Lietuvos sunkiųjų arklių veislės tyrimo duomenimis. Kliniškai ištirta 51 žemaitukų veislės arklys. Išsamus dantų būklės tyrimas šios veislės arkliams atliktas pirmą kartą. Tyrimas atliktas norint sukurti šių arklių sveikatingumo kontrolės programą. Trinarė dantų žymėjimo sistema taikyta užrašant ir analizuojant gautus rezultatus (Foster, 1996; Easley, 1999a). Nustatyti dantų pagrindiniai pokyčiai yra aštrūs emalio taškai ant viršutinio ir apatinio žandikaulio kaplių bei krūminių dantų, priekiniai užkarbiai, banguoti nuaugimai. Žemaitukų veislės arkliams nustatyti 65 dantų pokyčių tipai, tai yra 1,6 karto mažiau lyginant su Lietuvos sunkiaisiais arkliais (107) (Maslauskas et al., 2008). Tyrimo rezultatai parodė, jog išsamų klinikinį dantų būklės tyrimą pagal sveikatingumo kontrolės programą tikslinga atlikti visiems žemaitukų ir Lietuvos sunkiųjų veislės arkliams. Tai svarbu ne tik arklių gerovei, bet ir šių Lietuvos nacionalinių veislių išsaugojimui.

Raktažodžiai: žemaitukai, Lietuvos sunkieji, arklių dantų pokyčiai.

Introduction. The Žemaitukai is one of the oldest horse breeds in Europe that subsequently was the foundation for three horse breeds: Trakehner, Lithuanian Heavy Draught and large type Žemaitukai. This breed is recognized internationally and it is included into the FAO data bank of world domestic animal diversity. The evolution of domestic animals is supported by the latest genetic studies when the rare and unique T allele was found in the genome of the Žemaitukai breed. Therefore, preservation of the breed becomes the issue of both zootechnical and scientific importance (Macijauskienė, 2006).

In order to sustain the Žemaitukai breed it is important not only to maintain a purposeful good management and breeding programs, but it is essential to have a planned preventive health care program to improve the well being of the horses.

Dental diseases are known to affect the health status of horses significantly (Baker, 1998, 1999b, 1999c, 2005; Dixon and Dacre, 2005; Knottenbelt, 1999; Kirkland et al., 1994; Lowder and Mueller, 1998; Mueller, 1991; Peters et al., 2006; Pimentel et al., 2007). In 500 horse heads collected from an abattoir and examined, 80% had dental

diseases associated with oral pathology. The age of the horses examined ranged from 6 months to 30 years of age (Kirkland et al., 1994).

Dentistry and treating diseases of the horse's teeth are important in veterinary practice. Many authors point out that dental disease in the horse can result in disorders of other body systems (Knottenbelt, 1999). Signs commonly associated with dental problems are colic, quidding (spilling of rolled/chewed hay), spilling of feed, weight loss, excessive salivation, halitosis (bad smelling breath), nasal discharge, resistance to engage the bit and resistance to travelling on the right or the left rein (Dixon and Dacre 2005; Du Toit et al., 2008). The clinical signs of dental diseases in the horse may also go undetected for a long time by the owner or by the veterinarian even during the common clinical examination of the horse (Uhlinger, 1987). In a 2006 study of horses with chronic weight loss, dental disorders were the cause in 20% of cases (Tamzali, 2006). On Prince Edward Island, Canada, Christie et al. found that 63% of horses had never had a veterinary dental examination. Furthermore, of the horses that had their teeth examined, only 40.5% of them had their teeth examined at least once a year (Christie et al., 2004). With an improved understanding of the prevalence of dental disease and the normal morphology of equine teeth, the science of equine dentistry can make valuable contributions to the health and well being of horses (Kirkland et al., 1994).

Lithuanian Žemaitukai horses represent the ancient Lithuanian breed. However, there have been no studies of dental disease in this breed. Therefore, it is important to investigate Žemaitukai horses and their dental health in Lithuania.

Materials and methods

Population

The horses were from private stables and it was agreed with the owners to use them in this research. Altogether 51 of the Žemaitukai horses were examined (17 stallions and 34 mares) and the results were compared with the results of 50 horses of the Lithuanian heavy-drought breed (11 stallions and 39 mares) reported by Maslauskas et al., (2008).

Dental examination

The following equipment were used: 1) a full mouth Haussmann type speculum[a] for keeping the horse's mouth opened during accurate examination and palpation of the cheek teeth; 2) a light source "Mini Mag-Lite"[a]; 3) flexible fiber-optic extension for Mag-Lite AA[a] for examination of cavities; 4) a mouth piece for holding Mag- Lite AA[a] between the teeth of the examiner 5) drenching syringe[a] for dosing large quantities of water for cleaning the horse's mouth before oral examination; 6) Equivet telescopic dental mirror[a]; 7) a dental stick[a] for the investigation of interdental spaces; 8) equine dental evaluation and maintenance form (Easley, 1999a); 9) digital camera Sony DSC- P52[b] for keeping the digital images of the teeth of the each horse.

Analysis

The data was managed in Microsoft Excel and univariable and multivariable modelling was performed using Stata. Significance was set at $p < 0.05$ and a trend was set as $p \geq 0.05$ and < 0.1.

A Mann Whitney test was used to assess the association of horses' age of both breeds by sex, breed and age between two breeds. Further univariable tests assessed associations of age, sex and breed to the presence of various conditions such as the presence wolf teeth, ramps, rostral hooks, sharp enamel points, wave mouth and step mouth. Multivariable analysis was performed on such variables of interest as sharp enamel points, wolf teeth and step mouth in association with age, sex and breed.

Results

Population

When comparing data from Žemaitukai and Lithuanian heavy-drought breed horses there was no significant association of the horses' age to sex (p=0.3984), no significant differences in age between male and female horses, no significant association of age by breed (p=0.7958) and no significant differences in age between two breeds of horses. Further, there was no association of breed and sex ($x^2p=0.2033$).

Table 1. **The summary of the main dental finds in Lithuanian Žemaitukai horses**

Horses (Lithuanian Žemaitukai)			Findings														Total	
			Cheek teeth (106-111; 206-211; 306-311; 406-411)										Woolf teeth (105;205)		Canines (104;204; 304; 404)			
Group	Number of horses		SEP (MAX + MAN)		SEP (MAN only)		SEP (MAX only)		Rostral Hooks		Wave mouth							
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Group A	3	7	2	7									2				4	7
Group B	4	6	2	4	1	2				1			3	2			6	9
Group C	4	7	2	6				1					2	3	2		6	10
Group D	3	7	1	2	1	2	1		1					1	1	3	5	8
Group E	3	7	1	4						2	1	2					2	8
Total	17	34	8	23	2	4	1	1	1	3	1	2	7	6	3	3	23	42

Group a: 0-2 years, group b: 2- 4 years, group c: 4- 10 years, group d: 10- 18 years, group e: 18 years and older. Sep-sharp enamel points; max=maxilla; man=mandible; ♂= stallion; ♀= mare.

[a]Kruuse, Denmark

[b]Sony Corporation, Japan

Canines, Wolf teeth: Wolf teeth were found to be present in 25.5% (13/51) horses.

The retention of the canine teeth was found in 1 stallion/51 horses. Tartar accumulation on the canines was found in 2/51 horses. The rudimentary canine teeth were found in 3 mares/51 horses.

Cheek teeth: Sharp enamel points on both the buccal edges of the maxillary and the lingual edges of the mandibular cheek teeth were found in 60.7% (31/51) of the Žemaitukai horses examined. Sharp enamel points on the lingual edges of the mandibular cheek teeth only were found in 11.7% (6/51). Sharp enamel points on the buccal edges of the maxillary cheek teeth only were found in 3.9% (2/51) and rostral hooks were found in 7.8% (4/51) of the horses. Wave mouth was found in 5.8% (3/51) of the Žemaitukai horses.

Univariable analysis

Wolf teeth were found significantly (p=0.0257) more often in young horses compared with older horses. There was a trend for an association for male horses to the presence of wolf teeth (x^2p=0.0927). There was a trend for horses that had wolf teeth to be Lithuanian heavy-droughts.

Ramps were more commonly (x^2p = 0.0393) found in Lithuanian heavy- droughts compared with Žemaitukai horses. There was a trend for rostral hooks on the second maxillary premolar to be found more commonly in the Lithuanian heavy- droughts (x^2p=0.0771). Sharp enamel points were more commonly found in Lithuanian heavy-droughts (x^2p<0.001) compared with Žemaitukai horses.

Sharp enamel points were more often found in older horses (p=0.0846) in Lithuanian heavy-droughts. There was also a trend for association of sex and the presence of sharp enamel points (x^2p=0.817) as males had a trend to be more likely than females to have sharp points in Lithuanian heavy-droughts.

Wave mouth in Lithuanian heavy-droughts was found significantly (p=0.0535) more often in older horses compared with younger horses. There was no significant association of breed and the presence of a wave mouth (x^2p= 0.9). The presence of wave mouth was equally distributed between breeds.

Step mouth was more commonly found in Lithuanian heavy-droughts (x^2 p=0.0205) compared with Žemaitukai horses. There was a trend for horses with a step mouth to be older than horses without a step mouth (p=0.0814) in Lithuanian heavy-droughts.

Multivariable analysis

Wolf teeth: Multivariable logistic regression of the presence of wolf teeth to age, sex and breed showed several significant findings. For every 1 year increase in age the odds ratio for wolf teeth decreased by 0.88 (95% CI 0.81 – 0.98) with a p value = 0.015. Being a Žemaitukai actually had a decreased chance of having wolf teeth with odds ratio of 0.39 (95% CI 0.15 – 0.97) with a p value of 0.043. There was a trend for males to be more likely to have wolf teeth present with a p-value p=0.075.

Step Mouth: Multivariable logistic regression removed the breed variable since all step mouths were only in Lithuanian heavy-droughts. When controlling for age, sex was no longer significant as well as when controlling for sex, age was no longer significant.

Discussion

There were some dental abnormalities found in Žemaitukai horses and the results of these findings were compared with the results of dental findings in Lithuanian heavy-drought horses reported by Maslauskas et al. (2008). Sharp enamel points were the most common (76.4%) dental pathology found in Lithuanian Žemaitukai horses but were less common compared with Lithuanian heavy-drought horses (82%) (Maslauskas et al., 2008). This could be explained by the fact that Žemaitukai is an ancient breed and was fed only hay which is quite rough and therefore likely restricts the enamel overgrowths.

Horses had greater mandibular excursions in all directions when chewing hay, which has a larger particle size and higher fiber content then the pellets. As a consequence of the slower chewing cycles, it will take longer to eat a meal of hay than a meal of pellets, which has welfare implications both in terms of reducing boredom and prolonging the period of gastric filling. In horses that were free of dental overgrowths or pathologies, the range of mediolateral displacement of the mandible during mastication was sufficient to give full occlusal contact of the upper and lower dental arcades when chewing hay but not when chewing pellets (Clayton et al., 2007).

An ample diet, high in the type of roughage consumed by nondomesticated horses, promotes dental health through a greater range of mandibular motion and a slower chewing frequency (Bonin et al., 2007).

In other studies results have been as follows: 36/50 (72%) of the skulls examined had sharp enamel points in the teeth (Brigham and Duncanson, 2000), 281/483 (58.3 %) of the horses examined had sharp enamel points (Peters et al., 2006). Also Wilson (2005) in his study reported that 261/537 horses (48.6%) required floating of enamel points. The arrangement of the teeth within the upper and lower arcades is such that the curve of the upper dental arcade is not fully accommodated by the conformation of the lower arcade, i.e. the lower arcade is straighter and the distance between the left and right arcades is less in the mandible then in the upper jaw (Baker, 1999a). Žemaitukai horses have this arrangement of the teeth and develop the sharp enamel points too, which may be prevented by rasping.

'Wolf tooth' (Triadan 105; 205) (Foster, 1996; Easley, 1999a) is the common term used to describe the first upper premolar (Easley, 1999b). Wolf teeth (105; 205) were found in Žemaitukai horses (25.5%) and it is less compared with Lithuanian heavy-drought horses (42%), (Maslauskas et al., 2008). In Brighams (2000) study, 2/50 (4%) of the skulls had wolf teeth. The reported incidence of wolf teeth varies greatly; 13% (Baker, 1979), 18.8% (Wilson and Liyou, 2005), 20.6% (Pimentel et al., 2007) and 31.9% (Wafa, 1988), indicating that the wolf teeth may have been removed from part of the horses (Brigham and Duncanson, 2000).

Rostral hooks were not common in Žemaitukai horses (7.8%) compared with Lithuanian heavy-drought horses (20%) (Maslauskas et al., 2008). It may be explained by

the fact that Žemaitukai are fed only hay, which makes horses chew more as it is a rougher material. Lithuanian heavy-drought horses, on the other hand, are fed hay and haylage, which are softer and make horses chew less. In other studies, a higher incidence has been found; 13/50 (26%) skulls examined showed focal dental overgrowths (Brigham and Duncanson, 2000).

Rostral hooks were also common in the Dutch study where 33.5% of the horses with the breed distribution: Dutch Warmblood horses; Standardbreds; Friesian horses; Dutch riding ponies; and other breeds with the average age of 5.4 years with a range of 1 to 24 years. Of the total group of horses, 97% received an average of 2.7kilogram of concentrate each day with a maximum of 9.0kilogram. For roughage, 60.5% of the horses were fed hay, 32.3% were fed only haylage (high dry matter silage), and 7.2% were fed with a mixture of hay and haylage had rostral but 25% also caudal hooks (Peters et al., 2006).

Even more hooks and peaks were found in review of 607 horses with the breed distribution: Brasileiro de Hipismo, Lusitano, Mangalarga Marchador, Thoroughbreed, Quarter horse, Mangalarga Paulista and other breeds with the average age from 2 to 22 years performed by Pimentel (2007) of in altogether 1010 teeth with 495 (49.9%) rostral and 515 (50.1%) caudal hooks. On the other hand, Wilson in his study of 537 horses, 229 were mares (42.6%), 247 geldings (46%) and 61 stallions (11.4%) with age range from one year-of-age to 39 years-of-age had only 61/537 (11%) that had hooks present, which may indicate regular routine teeth care.

Abnormalities of wear such as ramps, hooks, wave, or step mouth may be caused by malpositioned teeth, asymetrical decidious premolar shedding, unequel eruption of opposing permanent teeth, central crown attrition, and infundibular cemental hypoplasia seen in maxillary cheek teeth (Rucker, 2007; Maslauskas et al., 2008).

Wave mouth was found in 5.8% of the Lithuanian Žemaitukai horses compared with Lithuanian heavy-drought horses (6%) (Maslauskas et al., 2008). Usually wave mouth is documented in about 3-8% of the horses (Brigham 2000, Peters et al., 2006, Pimentel et al., 2007, Wilson and Liyou 2005). Wave mouth can be prevented by regular dental examinations and care.

Dental calculus on the canines (Triadan 104,204; 304,404) (Foster, 1996; Easley, 1999a) was found in Žemaitukai horses (3.9%) and in Lithuanian heavy- drought horses (2%) (Maslauskas et al., 2008). In Brigham's study (2000), there were 7/50 animals (14%) that had bilateral calculus deposition (tartar) on the lower canines, but none had tartar on the upper canines. The lower canine teeth, lower incisors and buccal aspects of lower premolars are especially susceptible to gingivitis and periodontal disease secondary to tartar accumulation (Easley, 2005). Also these can be prevented early by removing tartar accumulations (Maslauskas et al., 2008).

Ramps is defined as the presence of more crown in a rising 'ramp' on 309-311 and 409-411 (Baker, 1999b). Ramps (Triadan 306, 406) were not found in Žemaitukai horses but it was documented in the Lithuanian heavy-drought horses (8%) (Maslauskas et al., 2008). Peters et al (2006) found 47/483 (9.7%) ramp cases and Wilson (2005) found 36/537 (6.7%) ramp cases. Ramps that form on the 306 and 406 (Foster, 1996; Easley, 1999a) can cause performance problems related to soft tissue trauma. They may force the mandible rostrally, putting extreme pressure on the temporomandibular joints. Mechanical forces on the 306 and 406 can cause the teeth to shift rostrally creating a diastema, which will lead to pocketing of feed and painful periodontal disease (Johnson and Porter, 2006). Also these can be prevented early by rasping (Maslauskas et al., 2008).

Step mouth was not found in any of Žemaitukai horses but it was reported in 10% of the Lithuanian heavy-drought horses (Maslauskas et al., 2008) which is fairly high compared with other studies. However, Peters et al. (2006) found only 4/483 (0.8%) stepped molar cases. Step mouth is extremely unequal wear of opposing teeth or dental extraction results in marked variations in the height of individual teeth and most often occurs between the third and fourth cheek teeth (Mueller, 1991). Furthermore, it can be prevented by removing retained deciduous caps on the third cheek teeth in young horses (Maslauskas et al., 2008).

Caries was not detected for the Žemaitukai horses but it was reported in the occlusal area on the both sides of the first two upper molars (2%) in Lithuanian heavy-drought horses (Maslauskas et al., 2008). Peters et al. (2006) documented altogether 42/483 (8.7%) cemental hypoplasia cases. Caries is the dissolution of the calcified tissues of the teeth, and occurs under a number of circumstances. In some environments, and under some feeding programs, foods that are cariogenic, i.e. caries forming, may adhere to the tooth crowns. The use of sweet feed, the high sugar content of molasses or the by- products of sweet- potato- processing plants produce a cariogenic diet (Baker, 1999c). The low number of caries in Lithuanian heavy-draught horses may be explained by the theory of cariogenic diet mentioned above as they are mostly fed hay ad libitum only (Maslauskas et al., 2008). Žemaitukai horses, on the other hand, from the old times are fed by hay only.

Disorders of incisors were not detected in Žemaitukai horses, but it was common (26%) in the Lithuanian heavy-drought horses (Maslauskas et al., 2008). This included traumatic damage to teeth, retained deciduous incisors and overbite. Wilson (2005) found that 110/537 (20.5%) horses examined had incisor abnormalities. In review by Dixon (1999) 44/400 cases (11%) suffer from primary disorders of their incisors. Because of their rostral position, equine incisors, in contrast to cheek teeth, are amenable to full visual examination (Dixon et al., 1999) so the abnormalities can be detected by the owner and corrected by a veterinarian in their early stages (Maslauskas et al., 2008). Žemaitukai horses are used for sports and recreational purposes and therefore owners are able to detect abnormalities of incisors and it can be corrected by a veterinarian in their early stages. Lithuanian heavy-drought horses, on the other hand, are kept for breeding purposes only and therefore disorders of incisors were not detected by the owners as it was mentioned

above.

Conclusions

Dental abnormalities in Žemaitukai horses (65) were found 1.6 times less compared with Lithuanian heavy-drought horses (107), (Maslauskas et al., 2008).

The most common dental abnormalities found in the Žemaitukai horses were sharp enamel points and rostral hooks and it is similar to the dental findings of Lithuanian heavy-drought horses. American Association of Equine Practitioners recommends that every horse should have a dental exam performed at least once a year (American Association of Equine Practitioners, 2008). Therefore, a complete oral examination every 6 to 12 months is recommended from the age of two years on to identify dental malocclusions or other dental pathologic conditions that may become clinically significant in time. At that age, the wolf teeth can be extracted if they interfere with biting, the retained deciduous incisive and premolars can be removed, and permanent teeth eruption checked as well as the sharp enamel points controlled. From five years on, the retained deciduous incisive and premolars can be removed, permanent teeth eruption checked and sharp enamel points controlled. To avoid the development of occlusal malalignments, such as wave and step mouths, clinical teeth examination once a year should be continued from the seventh year on. Rostral and caudal hooks and other pathologies can be detected and by removing them the mastication physiology of the horse can be restored. In horses older than ten years, wave, step or smooth mouth formation can be controlled by lowering the dominant teeth in the arcade. The removal of sharp enamel points will help in maintaining the physiology of mastication (Maslauskas et al., 2008). Regular dental care is important for the welfare and in keeping and sustaining the ancient Žemaitukai horse breed.

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