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EVALUATION OF THE CONFORMATION OF STALLIONS OF SELECTED HORSE BREEDS

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Abstract

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The aim of this study was to evaluate the conformation of stallions of the breeds American Quarter Horse (AQH), American Paint Horse (APH), Appaloosa (Appa), the Lipizzaner horse (LH) and the Old Kladruby horse (OKH). Representatives of these breeds are characterized as the descendants of horses on the base of the Arab-Berber blood. Western breeds (AQH, APH, Appa) due to different environmental conditions, nutrition and the other structure under the influence of a different type of use, type of riding demands differed considerably from the original Spanish-type horses. It was measured a total of 24 body dimensions. Representatives of The American western breeds are statistically highly conclusively ($P \leq 0.01$) in 23 of the 24 observed effects. To be precise, they are: smaller wither height as measured by stick, lower at the tail-set, longer neck, narrower chest, longer oblique body length, wider front pelvis length, longer pelvis bones, longer femur bones, shorter hind cannons.
A statistically significant difference ($P \leq 0.05$) was found in the length of the humerus, where the Old Kladruby Horse has a humerus that is longer by 2.34 cm than that of the APH.
The Lipizzaner horse differs statistically highly conclusively ($P \leq 0.01$) from the Appaloosa and Old Kladruby horse in the tape length of its head.

horses, body measurements, stallions, American Quarter Horse, American Paint Horse, Appaloosa, Lipizzaner horse, Old Kladruby horse

Horse measurement is the most objective and most accurate method of assessing horses. On the basis of measurements it is easier to select parental pairs for breeding the desired offspring and maintaining the breed standard.

The representatives of the measured horses in our observation are classified according to Dušek *et al.* (2007) as a group of breeds derived from Arab-Berber blood. A large role in their refining was played by the Old Spanish horse and perhaps the closely related Old Italian horse. Western breeds (AQH, APH, Appa) differed considerably from the original type of Spanish horses due to different natural conditions, different nutrition and under influence of the different usage and riding requirements. Even within their different types Western breeds are of a smaller to medium, often square frame and considering the different way of training and use (cattle work, Western-style riding), the conformation changed from the original Spanish type of horse. The Lipizzaner and Old Kladruby horse are descendants of the original type of Spanish horses and continue their traditions and type. They are still very elegant, harmonious riding and driving horses.

Literary overview

American Quarter Horse

The breed descends from the horses, which were brought to America by the Spanish conquistadors, and is the oldest American breed. The local settlers in Virginia and the Carolinas bred them to local

horses and to Thoroughbreds imported from Great Britain. These crossbreds ran the first races in North America (www.aqha.com). The American Quarter Horse was named for running quarter-mile tracks (quarter of a mile = approx. 400m) (Hermsen, 2002). Eventually these horses developed "cow sense" and were able to predict with incredible speed when the cattle will move, turn or stop (Draperová, 2003).

Quarter horses have a reputation for being a „small sleepy creature, which all of a sudden can shoot forth like lightning", which well demonstrates their quiet temperament and versatility. They are very intelligent, easy to work with and very reliable (Langrish and Swinneyová, 2005).

Evaluation of the horse's body is not just an evaluation of the individual parts but an assessment of the whole. The frame of the AQH is such that the horse meets the requirements for performing all required tasks in balance and effortlessly (Lečíková, 2004). It has a wither height between 143 and 161 cm. The head is rather short and broad, refined. The jaws are well-defined. The neck is of medium length, flexible, strong. The withers are muscular, long and little pronounced. The top line is well-coupled. The body is compact, the chest broad and deep, the back short and strong. The heavy and muscular flanks and gaskin give the animal its typical, robust appearance. The back end is broad, sloping and typically muscular (Price, 2004). The slender legs have flat bone, are clean, have high-quality joints and short pasterns. The pasterns should form an angle of about 45° – straight pasterns would not cope with dynamic movement. The thigh bone is the longest bone in the body. The hooves are round and open. The limbs are correct. AQH have a strong constitution with natural balance, they are very fast and agile (Hermsen, 2002).

Since 2003, the regulations of the American Quarter Horse Association strictly limit the amount of white markings and do not allow pink skin or white markings outside the allowed zones. Blue eyes are not allowed (AQHA, 2011); *use:* because of mechanization, the importance in the breeding of livestock decreased and so the AQH became a riding horse for leisure. At the end of the last century the AQH experienced a great renaissance in western-style competitions such as speed-racing, working disciplines and rodeo. At present it is a versatile breed used not only for sporting purposes, but also for recreation and hippotherapy (www.czqha.cz).

American Paint Horse

The American Paint Horse Association was founded in 1962 and keeps the registry of horses with original color markings of contrastive white and dark hair and skin and the typical conformation of cattle horses. It was founded with discarded horses – multiple-colored foals which were rejected for entry by the AQHA because of the extent of their white markings, although they fulfilled the pedigree requirements set by the AQHA (Draperová, 2003).

For a horse to be registered in the so-called regular registry of the American Paint Horse Association, it needs to fulfill the requirements for the minimum extent of the white color, and moreover, at least one of its parents must be registered with the American Paint Horse Association. The other parent has to be either an American Quarter Horse or a horse registered with the General Stud Book (English Thoroughbred). There is also a minimum requirement for the amount of white hair on unpigmented (pink) skin. (www.apha.com)

The wither height can be slightly higher than that of the AQH due to further breeding (APHA, 2005). It varies between 153 and 163 cm. The head is small; the forehead broad with friendly, expressive eyes, the muzzle resembles that of the Arabian. The withers are flat, well-muscled. The hind quarters are strongly developed. The bone is flat (www.czpha.cz). The Paint Horse has calm gaits with an exceptional potential for acceleration (Hermsen, 2002); *use:* Western disciplines, recreation.

Appaloosa

The spotted color of the American Appaloosa is derived from the horses imported by the Spanish conquistadors. The name „appaloosa" was given to these horses around 1870. The word originates from the Palouse area, which is named after the Palouse river (Draperová, 2003).

Native Americans of the Nez Percé tribe eventually learned to handle the horses of the colonists. However, in 1877 they were forced to quickly move to the Lapwai reservation. This move cost the lives of 900 Appaloosas. This breed was on the verge of extinction. The last animals and with them the fate of this breed were saved by Claud Thompson and Dr. Francis Haines, who founded the Appaloosa Horse Club U.S.A. on December 30, 1938 in Oregon (www.appaloosa.com).

The wither height varies between 147 and 157 cm. The head is broad, the eyes lively, the ears are small and pointed. The neck is muscular, the chest broad. Typical is the round, strong back end with highly set tail. The mane and tail is very fine, which together with the unpigmented genitalia, visible white of the eye and striped hooves is characteristic of the breed. The gaits are very comfortable and enjoyable. Typical is their canter, which has a high potential for acceleration, but remains pleasurable. Appaloosas are famous for their strong limbs with excellent hooves. It is an exceptionally hardy, undemanding breed (Hermsen, 2002); *use:* Western disciplines, versatility, hippotherapy (www.appaloosa.cz).

Old Kladruby horse

It is the only indigenous Czech breed, named after the stud in which it originated. The Kladruby Stud was founded in 1579 by Rudolf II. (Dušek *et al.*, 2007). The Old Kladruby horse is truly unique in the world in terms of pedigree as well as for being an example of successful breeding labor, which managed to resurrect this unique originally Czech

breed. In January of 1995 the breed was declared a national cultural monument. It is included in the Czech genetic resources. The breed was created on the basis of Old Spanish and Old Italian bloodlines and is one of the so-called Baroque breeds. The recorded pedigrees of current horses go back as far as the middle of the 18th Century (www.nhkladruby.cz). The breed is bred not only in the herd of the National Stud in Kladruby nad Labem (herd of greys) and the Slatiňany Stud (herd of blacks), but also by private breeders (Gotthardová, Dyková, 2004).

A typical feature of the Old Kladruby Horse is its Roman nose – convex head (Holecová, 2006). This Roman nose is a legacy of the Old Spanish ancestors of these carriage horses (Záliš, 2001). Other typical traits of the breed are a highly set, strong arched neck with less pronounced withers, a wide and deep chest, a strong, broad back-end, good flat bone, a steeper shoulder, enabling the typical movement - elastic, cadenced and spacious gaits with high knee-action in trot (Dušek, 1981). The height of these horses is 172–185 cm; *use:* gala-coach horse, harness horse used for ceremonial and representative service, driving, police, hippotherapy.

Lipizzaner horse

One of the oldest cultural horse breeds in Europe. Its origin is derived from the Old Spanish and Old Italian horses. It was bred in the royal Lipica stud in Slovenia. This famous stud was founded by regent Charles of Styria in 1580 (Dušek *et al.*, 2007). Nine Spanish horses and 24 mares, representatives of the breed that dominated horse riding until the 18th Century, were brought to Lipica from the Iberian Peninsula.

The Lipizzaner horse was popular with breeders for its hardiness, modesty, lively temperament, good character and trainability (www.sk.nztopolcianky.sk).

It is a harmonious, elegant and refined horse of medium frame and Baroque type, robust, with strong limbs and regular gaits. The head is often distinguished by a slightly convex head. The withers are not very pronounced and the shoulder is in concordance with the horse's shape, which is well-suited for harness as well as for riding. The gaits are rather high instead of long and low. The neck is strong, of medium length, highly set and carried. The chest is rather short and deep, compact and muscular the front is deep and wide. The back end is sloping and muscular. The tail is set highly. Typical of the Lipizzaner horse are short, strong limbs with flat joints and firm, well-formed hooves (Oulehla, 1996). The Lipizzaner horse matures later, but lives to a high age. Stallions reach a height between 155cm and 158cm (www.lipica.org); *use:* performing elements of classical dressage in the Spanish Riding School and also as a coach and riding horse (Misař and Jiskrová, 2001).

The conformation of horses

According to Lechner (1931) man has been judging the exterior of horses since ancient times. This is evidenced by writings of the ancient Greeks and Romans.

The basis for judging the conformation must be the breed standard. Without conformation standards, deviations in body shape are assessed mainly subjectively.

Misař and Jiskrová (2001) attribute particular importance to the evaluation of the conformation as it is one of the limiting selection criteria when selecting animals for breeding.

MATERIALS AND METHODS

Aim was to compare representatives of the following breeds:

1. American Quarter Horse (n = 24)
2. American Paint Horse (n = 20)
3. Appaloosa (n = 17)
4. Old Kladruby Horse (n = 21)
5. Lipizzaner Horse (n = 14).

96 stallions total were measured. Stallions of Old Kladruby Horse were owned by NH Kladruby nad Labem s. p. o., Lipizzaner stallions were owned by NŽ Topolčianky, š. p. and stallions of The American western breeds were owned in private sector. Stallions of Old Kladruby Horse and Lipizzaner horse were selected by observation based on their inclusion in their studbook. Measurement stallions of The American western breeds were inducted for the year 2012 in the Central Registry of stallions The Czech Republic. Another criterion of measured stallions was age 6–16 years. We took 24 body measures of a number of breeding stallions. Then the stallions of all five breeds were compared based on the values we obtained.

The measurements were taken with a measuring stick for horses, a tape measure for horses and a pocket measuring instrument with a spirit level. The stallions were measured on a firm level surface, were they stood with all four limbs evenly burdened, so that when viewed from the side, the right limbs were aligned behind the left limbs.

The reason for the low number of measured stallions of The American western breeds were insufficient information on stallions in private property.

The following body measures were taken:

The body measures are defined as follows (prepared in accordance with Bílek, 1933; Bílek *et al.*, 1957; Oulehla, 1996; Dušek *at al.*, 2007):

1. Wither height by stick (WHS)
2. Sternum height (SH)
3. Height at the back (HB)
4. Height at the croup (HC)
5. Height at the tailset (HT)
6. Chest circumference (ChC)
7. Tape length of head (TH)

8. Width of the jaw (WJ)
9. Length of neck (LN)
10. Length of shoulder (LS)
11. Chest width (ChW)
12. Humerus length (HL)
13. Length of the forearm (LF)
14. Front cannon length (FCL)
15. Front pastern length (FPL)
16. Front cannon circumference (FCC)
17. Oblique body length (OBL)
18. Front width of the pelvis (FWP)
19. Pelvis length (PL)
20. Thigh length (TL)
21. Tibia length (TiL)
22. Hind cannon length (HCL)
23. Hind pastern length (HPL)
24. Chest depth (ChD).

The data were statistically evaluated by a linear GLM model in the STATISTICA 9 program.

Model equation of linear model with fixed effects (GLM):

$$y_i = \mu + s_i + e_i,$$

where:
y_i.... observed effect
μ.... overall average of the file
s_i.... fixed effect of the i-breed (i = 1, 2, 3, 4, 5)
e_i.... random effect.

In case a monitored effect showed a statistically conclusive effect, differences between individual factors were determined by method of multiple comparisons according to Scheffe.

RESULTS AND DISCUSSION

Highly statistically significant differences were identified in 23 of the observed measures according to the breed factor. In 10 of the observed measurements conclusive differences according to breed factor were detected.

Statistically highly conclusive differences were found mostly between the group of American

I: *Comparison of the breeds based on their body measurements in cm*

	AQH		APH		Appa		OKH		LH	
	average	sx	average	sx	average	sx	average	sx	average	sx
WHS	148.5	0.75	149.6	0.79	151.4	1.02	**168.3**	0.82	156.5	1.04
SH	77.4	0.57	77.5	0.60	79.1	0.78	**88.8**	0.62	81.8	0.79
HB	141.2	0.86	142.1	0.90	146.4	1.17	**158.4**	0.94	147.1	1.19
HC	148.5	0.64	149.4	0.68	151.2	0.87	**166.0**	0.70	155.0	0.89
HT	140.0	0.70	139.8	0.73	140.9	0.95	**156.4**	0.76	145.9	0.96
ChC	181.3	1.11	183.8	1.16	182.1	1.50	**196.6**	1.20	188.7	1.53
TH	50.5	0.49	51.9	0.52	53.3	0.67	**57.2**	0.54	50.1	0.68
WJ	11.4	0.20	10.8	0.21	11.2	0.27	**12.5**	0.22	12.1	0.27
LN	86.2	0.71	**87.8**	0.74	84.8	0.96	76.6	0.77	71.9	0.97
LS	56.9	0.70	57.8	0.73	55.9	0.94	61.1	0.76	**61.6**	0.96
ChW	38.4	0.82	39.6	0.86	39.1	1.11	44.5	0.89	**45.1**	1.13
HL	44.3	0.46	42.8	0.49	44.3	0.63	**45.1**	0.51	44.9	0.64
LF	41.7	0.52	43.3	0.55	43.7	0.71	**48.3**	0.57	46.1	0.72
FCL	26.3	0.35	26.3	0.37	28.2	0.48	**30.9**	0.38	27.4	0.49
FPL	12.1	0.19	12.0	0.20	12.6	0.25	**14.1**	0.20	13.1	0.26
FCC	19.9	0.16	20.0	0.17	20.9	0.22	**22.5**	0.18	21.2	0.22
OBL	**175.4**	1.07	174.0	1.12	176.4	1.45	170.2	1.16	161.7	1.47
FWP	**65.0**	0.83	64.5	0.87	59.6	1.13	55.4	0.90	52.5	1.15
PL	60.9	0.64	61.2	0.67	**61.5**	0.87	55.4	0.69	57.2	0.88
TL	**71.7**	0.66	70.7	0.69	70.5	0.89	56.6	0.71	56.2	0.91
TiL	51.8	0.80	51.7	0.84	52.6	1.08	**57.0**	0.87	56.5	1.10
HCL	31.4	0.39	31.5	0.41	33.1	0.53	**44.1**	0.42	38.2	0.54
HPL	12.5	0.21	12.5	0.22	13.9	0.28	**14.6**	0.23	13.4	0.29
ChD	71.1	0.48	71.8	0.50	71.9	0.65	**79.5**	0.52	74.6	0.66

Maximum values highlighted in bold, red
Minimum values highlighted in bold, blue

western horses (AQH, APH, Appa) and the group of harness horses (OKH, LH).

Statistically highly conclusive differences in all representatives of the western breeds:

- Lower wither height
- Lower at the tail-set
- Longer neck
- Narrower chest
- Longer oblique body length.
- Wider front width of the pelvis
- Longer pelvis bones
- Longer humerus
- Shorter hind cannons.

These results are consistent with the current use of the observed breeds. Representatives of the American western breeds are bred for cattle work, so a smaller wither height is required together with a long neck for better balance and stability in quick maneuvers.

According to Bílek *et al.* (1957) the pelvis is a lever of strength. Therefore a long and wide pelvis is most suitable as it enables the development of the muscles that are attached to it.

The femur according to Dušek *et al.*, (2007) should be as long as possible and sloping, so that in movement the shift from behind is as big as possible. American Western breeds are known for their rapid acceleration. With a long front and short cannon the horse does not need to lift its front very high in walk and trot. The gait is flatter and longer. These statements are supported by our findings.

The Lipizzaner horse, other than the Old Kladruby horse, is bred not only as a carriage horse, but also for riding. Statistically highly conclusively, they differ from the Old Kladruby horse by a lower wither height (by 12.61 cm), a lower sternum (by 7.4 cm), lower at the back (by 11.9 cm) lower at the croup (by 11.7 cm), lower at the tail-set (by 11.3 cm), smaller chest circumference (by 8.6 cm), shorter neck (by 4.3 cm), shorter front cannon (by 3.7 cm), shorter front pastern (by 1.1 cm), weaker cannon (by 1.4 cm) shorter oblique body length (by 8.3 cm), shorter hind cannon (by 6.5 cm), shorter hind pastern (by 1,2 cm), shallower chest (by 5.2 cm). These findings correspond with the demands on the Lipizzaner horse in riding type to perform demanding figures of the high riding, where a compact horse of a lower, square frame is required, with shorter limbs, with a better ability to collect.

On the other hand there is no evidence of a difference between the Lipizzaner horse and the Appaloosa in sternum bone height (difference of 2.6 cm), the back height (difference of 0.5 cm), length of the forearm (difference of 2.3 cm), front pastern length (difference of 0.5 cm), circumference of the front cannon (difference of 0.2 cm), tibia length (difference of 3.8 cm). Not only are the representatives of the Appaloosa breed larger in height dimensions in comparison with the other American Western breeds, the bones of their limbs are longer too.

The Lipizzaner horse differs statistically highly conclusively from the Appaloosa and Old Kladruby horse in the tape length of its head. Contrarily, no difference was when compared to the American Quarter Horse and American Paint Horse (shorter). In the older bloodlines of the Appaloosa we can see the occurrence of Roman noses.

The Lipizzaner horse differs statistically highly conclusively form the American Paint Horse in its jaw-width. The American Paint Horse has the statistically highly significantly narrowest jaw.

The length of the shoulder, width of the chest, length of the forearm, front width of the pelvis, length of the pelvis, pastern length and tibula length do not differ in the Lipizzaner and Old Kladruby horse. This corresponds with the demands for harness horses moving with typical high knee action.

CONCLUSION

The representatives of the observed breeds are characterized as descendants of horses deriving from Berber-Arab blood. Due to living in different natural environments and to the different structure of their nutrition, the Western breeds differ significantly from the breeds in the original Spanish type.

The current representatives of the Baroque breeds excel in high knee action, where the American Western breeds have flatter movement, but are capable of rapid acceleration. This is caused by their different wither heights and different lengths of the bones forming the front and hind limbs.

It was proved the American western Breeds and harness breeds differ statistically highly conclusively ($P \leq 0.01$) in 23 of the 24 observed effects. To be precise, they are: smaller wither height as measured by stick, lower at the tail-set, longer neck, narrower chest, longer oblique body length, wider front pelvis length, longer pelvis bones, longer femur bones, shorter hind cannons.

A statistically significant difference ($P \leq 0.05$) was found in the length of the humerus, where the Old Kladruby Horse has a humerus that is longer by 2.34 cm than that of the APH. It was also confirmed that the measured values of the observed representatives correspond with the types and directions of current breeding programs. The American Western breeds of the American Quarter Horse and American Paint Horse are bred mainly for cattle work and reining disciplines – which is consistent with the tendencies to breed reining-cutting bloodlines in the Czech Republic. The Appaloosa nowadays is used mainly for the esthetic disciplines of Western sport, in which representatives with higher wither heights are required. The Old Kladruby horse is mostly used as a gala-coach horse. The Lipizzaner horse is bred not only for coach purposes, but also as a riding horse and for the figures of the High Riding School.

The measured values of the body dimensions will help breeders obtain a more objective overview of the conformation of horses used for breeding, and due to the more accurate characteristics of the conformation of breeding stallions, with the aid of numeric data will allow to better create mating plans.

SUMMARY

Aim of this study was to evaluate the body composition stallions of breeds American Quarter Horse (AQH), American Paint Horse (APH), Appaloosa (Appa), Lipizzaner horse (LK) and Old Kladruby horse (STK). The representatives of these breeds are characterized as the descendants of horses on the base of the Arab-Berber blood.

A total of 96 stallions were measured. We took 24 body measures of a number of breeding stallions. Then the stallions of all five breeds were compared based on the values we obtained.

The measurements were taken with: a measuring stick for horses, a tape measure for horses and a pocket measuring instrument with a spirit level. The stallions were measured on a firm level surface, were they were stood with all four limbs evenly burdened, so that when viewed from the side, the right limbs were aligned behind the left limbs.

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The Lipizzaner horse differs statistically highly conclusively ($P \leq 0.01$) from the Appaloosa and Old Kladruby horse in the tape length of its head.

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