

## THOROUGHBRED HORSES' GROWTH RATE AND OSSIFICATION OF BASAL CARTILAGE OF RADIUS BONE LOWER END AT THE BEGINNING OF TRAINING<sup>1</sup>

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**Abstract:** Among all factors deciding about the access of Thoroughbred horses in first races the main roles plays the evaluation of somatic maturity, which is highly correlated to the "skeletal age". In horses the "skeletal age" is defined on the base of the time of basal cartilages disappearance using for this the X-ray pictures of horses' legs. The best indicator of "skeletal maturity seems to be the basal cartilage of radius bone lower end because it disappears as the last cartilage in age about 24-32 months of life and also because it is very easy and detailed to evaluate of X-ray pictures. The aim of this study was to evaluate the dependencies between the ossification state of basal cartilage of radius bone lower end of Thoroughbred horses at the beginning of training and their biometric parameters and growth rate in period of first 18 months of life. The study was carried out on 26 Thoroughbred horses (12 colts and 14 fillies) born in Moszna and Krasne studs. The biometric analysis of three basic measurements (height at withers, girth and cannon circumference) was conducted during 18 months after birth. Measurements were done after birth (0) and in 3, 6, 9, 12 and 18 months of life. The growth rate of particular measurements was calculated according to formula:

$$T = \frac{W_2 - W_1}{\frac{W_2 + W_1}{2}} \times 100$$

where:  
W<sub>1</sub> – initial value of the measurement  
W<sub>2</sub> – final value of the measurement

X-ray pictures of radius bone were done on the race track just before beginning of training. On this base the vet pointed the horses' skeletally matured (cartilage closed) and skeletally immature (cartilage open). The results were statistically evaluated by one factor variance analysis and Scheffe's test using SAS program. It was stated that horses with closed cartilage of radius bone lower end before training beginning were characterized by higher growth rate of height at withers and cannon circumference during first 18 months of life compare to skeletally immature horses (open cartilage), which obtain higher average values of biometric measurements.

**Key words:** Thoroughbred horse, growth rate, basal cartilage

### *Introduction*

One of the significant elements differ the Thoroughbred horses from rather breeds is rather short period from their birth and the time of their use as saddle horse (racing). As 18 month old horses they are moved to Race track where after 6 months long training they take parts in exhausting races. To rise to training difficulties they should be characterised by the proper growth and development. Among all factors deciding about the access of Thoroughbred horses in first races the main roles plays the evaluation of somatic maturity, which is highly correlated to the "skeletal age". In horses the "skeletal age" is defined on the base of the time of basal cartilages disappearance using for this the X-ray pictures of horses' legs. The best indicator of "skeletal maturity seems to be the basal cartilage of radius bone lower end because it disappears as the last cartilage in age about 24-32 months of life and also because it is very easy and detailed to evaluate of X-ray pictures (Mason and Bourke, 1973; Gabel et al., 1977). The aim of this study was to evaluate the dependencies between the ossification state of basal cartilage of radius bone lower end of Thoroughbred horses at the beginning of training and their biometric parameters and growth rate in period of first 18 months of life.

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### Material and Methods

The study was carried out on 26 Thoroughbred horses (12 colts and 14 fillies) born in Moszna and Krasne studs. The biometric analysis of three basic measurements (height at withers, girth and cannon circumference) was conducted during 18 months after birth. Measurements were done after birth (0) and in 3, 6, 9, 12 and 18 months of life. The growth rate of particular measurements was calculated according to formula:

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### Results and Discussion

In first 18 months of life higher average value of height at withers were characterised for horses with not finished process of skeletal maturation at the beginning of training at race track. The difference in height of 2,54 cm in third month of life appeared significant compare to horses with closed basal cartilage (Tab. 1). Except first three months the growth rate of height at withers was higher in Thoroughbred horses with closed basal cartilage (Tab. 2) but significance of these differences were not statistically proved. In horses with open basal cartilage the higher average value of girth circumference was stated. Highly significantly lower circumference value was observed in 6 and significantly lower in 9 month for horses with closed cartilage and the differences were respectively 5,69 cm and 4,08 cm (Tab. 1). Growth rate of girth circumference obtained the highest value during 18 months of life – 68%. During all studied period the average value of this parameter were higher in horses with open cartilage, the highest differences (3,47%) were noted in first 6 months of life but the differences was not statistically proved (Tab. 2).

Table 1. Biometric measurements of Thoroughbred horses with different level of lower end of radius bone ossification

Month of age	Height at withers [cm]		Girth circumference [cm]		Cannon circumference [cm]	
	Open cartilage n=13	Closed cartilage n=13	Open cartilage n=13	Closed cartilage n=13	Open cartilage n=13	Closed cartilage n=13
0	101,38	99,54	83,38	82,77	11,94	11,50
3	120,23 a	117,69 a	113,85	112,77	14,17	13,69
6	130,23	128,00	132,92 A	127,23 A	15,54	15,12
9	139,00	137,08	147,08 b	143,00 b	16,96	16,54
12	145,62	144,00	159,00	157,00	18,10 c	17,52 c
18	153,54	152,15	170,00	168,15	19,50 d	18,87 d

Means marked with the same capital letters differ significantly at  $P \leq 0.01$

Means marked with the same small letters differ significantly at  $P \leq 0.05$

Table 2. Growth rate of Thoroughbred horses' with different level of lower end of radius bone ossification

Month of age	Growth rate of Height at withers [%]		Growth rate of girth circumference [%]		Growth rate of cannon circumference [%]	
	Open cartilage n=13	Closed cartilage n=13	Open cartilage n=13	Closed cartilage n=13	Open cartilage n=13	Closed cartilage n=13
0 - 3	17,01	16,79	31,03	30,77	17,00	17,39
0 - 6	24,93	25,10	45,93	42,46	26,13	27,14
0 - 9	31,30	31,80	55,34	53,44	34,71	35,94
0 - 12	35,83	36,59	62,51	62,03	40,94	41,46
0 - 18	40,95	41,89	68,48	68,15	48,05	48,51

In horses with not finished skeletal maturation process before training, which were characterized by higher height at withers and girth circumference the higher value of cannon circumference was also observed. The significant difference was noted in 12 and 18 months of life compare to horses with closed cartilage (Tab. 2). However mentioned above horses from birth to 18 month of life compensated the lower cannon circumference by higher value of growth rate of this parameter but the differences were not statistically proved. The subject of Thoroughbred foals' growth and development was the aim of many scientific works. Most authors showed that Thoroughbred horses develop in the most intensive way to 6 month of their life so to the weaning time (*Jelan et al.*, 1996; *Kulisa and Łuszczynski*, 2000; *Łuszczynski et al.*, 2001; *Łuszczynski et al.*, 2002). Similarly like in this work the authors stated that Thoroughbred horses compensated the lower values of biometric parameters by highest growth rate. *Rossdale* (1986) stated that these horses develop very intensively till the 18 month after birth but *Magnusson* (1985) proved that warm-blood horses obtain their adult body measurements just in 3 year of life. The analysis of Canadian Thoroughbred growth rate was carried out by *Hintz et al.*, (1979). In English environment this subject was worked out by *Green* (1976) and *Mac Carthy* (1978) who obtained result similar results compare to those obtained in this work. Dependencies between the time of basal cartilage disappearance and biometric parameters and growth rate in Thoroughbred horses at a race track were also studied by *Łojek* (1993a). Horses with the latest disappearance of basal cartilage were characterized by highly significant average values of height at withers, girth circumference and cannon circumference compare to animals with earlier time of cartilage disappearance. Similar tendency was observed for growth rate of two first parameters but cannon circumference was not significantly lower. The age of skeletal maturity had also an effect on racing performance of 2-years-old race horses (*Łojek*, 1993b). Horses with late and average age of basal cartilage disappearance obtained higher value of general handicap. According to *Łuszczynski et al* (2005) horse with closed cartilage before training beginning started and won oftener than horses with open cartilage however horses with open cartilage won more money, obtained higher value of general handicap and coefficient of success.

#### Conclusion

Horses with closed cartilage of radius bone lower end before training beginning were characterized by higher growth rate of height at withers and cannon circumference during first 18 months of life compare to skeletally immature horses (open cartilage), which obtain higher average values of biometric measurements.

## PORAST ENGLSKIH PUNOKRVNIH KONJA I OSIFIKACIJA BAZALNE HRKAVICE DONJEG DELA PALČANE NA POČETKU TRENINGA

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#### Rezime

Među svim faktorima koji utiču na učestvovanje punokrvnih konja u prvoj treći najvažniji je ocajn somatske zrelosti koja je u korelaciji sa "skeletalnim uzrastom". Kod konja, "skeletalni uzrast" se definiše na bazi vremena nestanka bazalne hrskavice korišćenjem rendgenskih snimaka noge konja. Najbolji indikator zrelosti skeletal se čini da je bazalna hrskavica donjeg dela palčane kosti zato što ona nestaje kao poslednja hrskavica u uzrastu od 24-32 meseca I zato što se veoma lako I detaljno može analizirati na rendgenskim snimcima. Cilj ovog istraživanja je bio ocajn zavisnosti između stadijuma osifikacije bazalne hrskavice donjeg dela palčane kosti kod punokrvnih konja na početku treninga I njihovih biometrijskih parametara I brzine porasta u periodu od prvih 18 meseci života. Ispitivanje je izvedeno na 26 engleskih punokrvnih konja (12 ždebaca i 14 ždebica) rođenih na ergelama Moszna i Krasne. Biometrijska analiza tri osnovne mere (visina grebena, obim i obim cevanice) izvedena je 18 mesecia nakon rođenja. Merenje je izvršeno nakon rođenja (0) i u 3, 6, 9, 12 i 18 mesecu života. Brzina porasta određenih mera je računata prema formuli:

$$T = \frac{W_2 - W_1}{\frac{W_2 + W_1}{2}} \times 100$$

gde:  
 $W_1$  – početna vrednost mere  
 $W_2$  – konačna vrednost mere

Rendgenski snimci palčane kosti su rađeni na trkalištu pre početka treninga. Na bazi ovih snimaka veterinary je ukazivao na zrele (zatvorena hrsakvica) i nezrele (hrskavica još otvorena) skelete kod konja. Rezultati su statistički obrađeni korišćenjem jednofaktorijalne analize varijanse i Scheffe - ovog testa korišćenjem SAS programa. Utvrđeno je da konji sa zatvorenom hrskavisom palčane kosti odnosno njenog donjeg dela pre početka treninga imaju bolji porast visine grebena i obima cevanice tokom prvih 18 meseci života u poređenju sa konjima kod kojih skelet nije razvijen (otvorena hrskavica), kosi so dobili više prosečne vrednosti biometrijskih mera.

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