

Main biological characteristics and peculiarities of Mongolian horses

B.Luvsansharav, PhD, prof., University of Ulaanbaatar,
D.Bayanbat, MSc, distinguished horse trainer of the province

Brief information on nature and climate in Mongolia

Natural, geographical and climatic conditions of Mongolia create ecology of Mongolian horse, the native breed horses evolved as the results of long lasting natural selections and folk selective breeding from generation to generation and a number of specific morphological and morpho-ecological adaptations developed in their body.

Mongolia is situated on the very heart of Central Asian plateau, and the territory consists of western region with Gobi-Altai and Mongol-Altai mountains at 2500 to 3000 m latitude above sea level, the northern region with forest rich mountains of Khangai, Khentii and Khuvsgul at 2000 to 2500 m, and eastern Mongolian steppe and southern Gobi region with lower hills at 1000 to 1500 m.

Generally the territory of Mongolia is divided into 2 very different parts, one of which is western and northern west mountainous, and another is eastern and southern steppes and gobi areas. Such differences make the territory similar to eastern Siberian in northern regions, and to semi-desert steppe lands of Central Asia in southern regions.

Such natural and geographical specificities characterized with areas far from oceans and surrounded with high mountains result in severe continental climate of Mongolia and having four seasons a year.

Depending on the regional features, yearly average air temperature ranges from $-3,75^{\circ}\text{C}$ to $+3,75^{\circ}\text{C}$, average temperature in warmest month or July is from 16°C to 24°C , average temperature in coldest month or January is from -11.5°C to -23°C , number of cold days ranges between 70 and 225 and precipitation is from 100 mm to 400 mm in Mongolia.

Origin of Mongolian horse. Up to now the conception of Mongolian horse origin has still not been completely established. Sh.Sengee noted that takhi is not only wild animal native to Mongolia, but also the closest ancestor of Mongolian horse.

Justification of this conclusion is that both takhi and Mongolian domestic horse have been co-existing in the same nature-ecological conditions of Mongolia, and they are able to produce fertile hybrids.

Takhi and Domestic Mongolian horse differ with chromosome numbers and morphology. Takhi has a total of 66 chromosomes per cell, while domestic horse 64. Mongolian horse chromosome set includes 26 metacentric and 36 acrocentric autosomes, and 2 sex chromosomes, whereas takhi's includes 24, 40 and 2 respectively. However, an extra pair of metacentric chromosome in domestic horse is associated with that two acrocentric chromosomes joined together as a whole one during evolutionary process. According to current understandings, dominance of acrocentric chromosomes in animal karyotype reveals the animal is at lower stage of the development. Therefore, it is seen that wild horse or takhi

might be the ancestor of domestic Mongolian horse, at the lower evolutionary level (M.Tumurjav, 2004). More detailed studies of this issue by using cytogenetic, molecular biological and biochemical techniques and determination of Mongolian horse origin on the basis of more advanced studies are of theoretical and practical significance.

Significance of horse husbandry in Mongolia. Since time immemorial there has been a historical traditions that Mongols breed and raise horse with greater respects and love. For the time period of human beings origin and statehood development in Mongolia, horse populations were essentially important for riding, harnessing and using for not only economic purposes, but also war and political purposes. Mongols were being used horses for posts, communications, hunting and transportations, as well as their livelihoods were also provided all types of horse products. Because living of Mongolian people is associated with horses, horses were most broadly described in all types of arts and cultures such as ancient writings and books, literatures, songs, dances, fine arts, and other crafts. Nowadays, there are approximately 500 songs related to horses and the best folk musical instrument is horse head fiddle.

Body conformation of Mongolian horse. There are only descriptions about horse body conformations, using, growing and selection of horses in ancient writings of Mongols. One of such writings is the book entitled “Characters of race horses” printed in 1735. This book describes attempts to describe horses in comparison with such animals as red deer, musk deer, ibex, hare, donkey and boar.

In this writing, horse for riding should have light and small head, eagle eyes, erect, but not large ears, thin body, muscular thorax, not broader distance between both legs, thick and far from the bone tendons of legs, strong hooves, and deep frogs, and the most suitable coat color is black, also white and palomino. Summarizing this writing in a number of volumes, Kh.Luvsanbaldan wrote the book “Features of Horse” (1966 and 1989) and M.Davaakhuu published books “Secret of Horse Trainer” (1999) and “Golden Sutra of Horse” (2014). Horse features described in these writings are basically similar to categorizations of horse body constitutions such as rough, nonsolid, delicate, solid and sound as used in current Russian Federation and many other countries. These categorizations are followed in selective breeding of livestock of all other types.

Generally, Mongolian horse body conformation can be described as that Mongolian horse has smaller, longer body, rough and large head, short ears, smaller eyes, short and thick neck, deep and broad chest, relatively longer and straight back, sloppy croup, shorter and stronger legs, hard tendons, well adapted body shapes and strong body.

Body size of Mongolian horse varies with geographical localizations of the areas of horse breeding. For example, height at withers, diagonal length of body, heart girth, cannon bone girth of horse bred in Khankhukhii and Great lakes hollow areas is 133.1 cm, 137,1 cm, 156.4 cm and 17.4 cm respectively, whereas they are 125.5 cm, 128.2 cm, 151.4 cm, and 16.8 cm in horses grown in Gobi region. Generally, body sizes of Mongolian horses are as follows: height at withers, diagonal length of body, heart girth, cannon bone girth of stallion

ranges from 132 to 134 cm, 134 to 137 cm, 164 to 167 cm and 18 to 18.7 cm respectively, while those in mares range between 124 and 126 cm, 133 and 136 cm, 164 and 170 cm, and 17.5 and 18.5 cm respectively. There are several strains of horses differing with their own body conformations and constitutions among Mongolian horses. Native Mongolian horses are divided into such strains as Galshir, Tes river, Myangad and Darkhad white.

Galshir horses are bred in Galshir soum of Khentii aimag. This strain horses are characteristic with race horse body constitutions and conformations, adapted very well to steppe lands.

Tes river horses. Nucleus breeding stock of this horse are kept in Zuungobi soum of Uvs aimag, Bayantes and Bayan-Uul soums of Zavkhan aimag, Tsetserleg and Tsagaan-Uul soums of Khuvsgul aimag. Tes horse withers and croup are longer by 1 to 8 cm and more bony than other Mongolian horses. Capability of this horse for riding and racing is better. Use of Tes horse in daily riding and work for 8 hours with 9 to 10 hours grazing and 3 hours interval without feed to overcome 1082 km distance resulted in loss of 4.2% of body weight.

Darkhad horse. Horses of this strain are raised by grazing only in Khuvsgul-Sayan areas, which are at 2300 to 2500 m altitude above sea level, have 40 to 50 cm snow fall and cold till minus 80°C in winter. Darkhad horse is very resistant and hardy, withstands such loads as riding and works, and have greater strength, sound body constitution, strong legs and hooves. It has higher milk yields, other Mongolian horses produce 300 to 350 ml milk, whereas Darkhad mare can give 500 to 800 ml milk.

Myangad horse. The horse is grown in specific areas with severe climatic conditions of Myangad, Durgun, Alktan khukh and Great lakes hollow in Khovd aimag. Myangad horse has massive body or mature mare weighs 340 to 360 kg, while its stallion weighs 350 to 370 kg. One tenth of Darkhad horses have extra ribs and vertebrae, its daily milk yield ranges from 2.3 to 3.0 liter or can produce 225 to 250 liter milk for 90 days. The milk has higher fat content.

Mongolian horse growth and development. Mongolian horse growth and development is significantly different than those kept in stationary condition with better feeding and caring. Birth weight of Mongolian horse foal is between 34.3 and 25.7 kg. Weight of male foal is greater by 1.4 kg in average than female one. Daily weight gain after the birth of Mongolian foal is very intensive and reaches 516.4 to 606.1 gram for 6 months, and then slows greatly for the next 6 to 12 months and decreases to 55.2 gram. It is associated with that pasture plant withering, reduction of their nutritive values and climatic effects of cold season. However, average daily weight gain increases again to 494.2 g for 12 to 18 months. Because this period is warm season during summer and autumn in Mongolia, it is suitable for livestock fattening. During this period, 18 months old age horse has gained 59.7% of body weight of fully matured horse. When horse is 18 to 24 months old, 27.6 kg or 13.19% of its body weight are lost during winter and spring seasons. For 30 to 36 months old horse, loss of body weight is 49.9 kg or accounts for 19.2% of its body weight by the spring.

Table 1. Dynamics of Mongolian horse live weight (T.Saipolda, 1995)

Age /months/	No. of horses	Live weight, kg	Daily weight gain, g	Relative growth, %	Percentage of weight in mature horse weight
		M±m			
0	20	35,6	-	-	10,2
1	65	53,7±3,3	587,1	51,1	15,3
3	40	93,1±6,2	606,1	73,4	26,6
6	34	121,5±4,8	516,4	30,5	34,7
12	35	132,5±6,4	55,2	9,1	37,8
18	30	209,1±8,4	494,2	57,8	59,7
24	51	181,4±7,3	-116,2	-13,3	51,8
30	42	258,7±8,5	499,3	42,7	73,9
36	28	208,8±7,9	-321,9	-19,3	59,6
42	28	284,8±7,4	472,0	36,4	81,4
48	12	243,4±5,4	-230,0	-14,5	69,2
54	14	303,7±7,1	374,5	24,8	86,8

Above study demonstrates that growth and development of Mongolian horse is now so intensive. Mongolian horse of 30 months old age has 73.9% body weight of mature horse. Researchers investigated since that period the growth slows and become fully mature at 7 to 8 years old ages.

Meat productivity of Mongolian horse. Traditionally Mongolian people were using horse meat for their food since ancient time.

Table 2. Weight and yield during slaughter of Mongolian horse (T.Saipolda, 1995)

Parameters	Ages				
	2 years old	3 years old	4 years old	5 years old	Mature horse
Weight before feed withdrawal, kg	227.6	245.0	266.5	308.3	345.3
Weight before slaughter, kg	213.0	233.0	262.5	301.3	332.4
Weight of chilled carcass, kg	102.0	107.2	121.5	143.7	150.2
Weight at slaughter, kg	107.7	114.3	133.0	153.2	155.6
Yield at slaughter, %	50.5	49.0	50.6	50.8	46.8
All by-products, kg	39.9	47.2	53.1	62.1	67.8
Yield of by products, % /to weight before	18.7	20.2	20.2	20.6	20.4

slaughter /					
Yield of edible parts, %	69.2	69.2	70.8	71.4	67.2

According to the study by Saipolda, Mongolian horse yield at slaughter accounts for 46.8 to 50.8% depending on the horse age and fattening plane. Ch.Unenburen reported Slaughter yield of Mongolian horse reached 50 to 55%, while J.Gungaa wrote it accounts for 51.8 to 53.8%.

Depending on age of horse, by products weigh 39.9 to 67.8 kg or account for 18.7 to 20.6% of pre-slaughter weight.

Fleshiness score. One of major assessment values of horse meat is its fleshiness score. Fleshiness score, and meat to bone weight and meat to fat weight ratios are shown in the following table.

Table 3. Fleshiness score

Parameters	Age /months/				
	18	30	42	54	16
Fleshiness score	4,6±0,12	4,1±0,2	4,4±0,07	5,3±0,2	5,0±0,5
Meat-bone ratio	4,1±0,10	3,6±0,15	3,8±0,08	4,5±0,3	4,2±0,6
Meat-fat ratio	12,2±0,21	10,8±0,18	8,9±0,03	8,1±0,02	7,3±0,72

Although both fleshiness score and meat-bone ratio drop slightly at three years old age, they increase till 16 years old age. Fleshiness score for five year old horse is the highest among all other age group horses and its probability indicator was significant ($P>0.99$). Depending on the age of horse, there are 4.1 to 5.3 kg meat and fat per 1 kg bone. The older the age of horse, the lower the meat-fat ratio (12.1 to 7.3). It is associated with increasing relative percentage of fat gained in the body with the horse ageing.

Diameter of muscular fiber is directly associated with meat values. G.A.Grusheskii (1968) reported that diameter of longissimus dorsi muscle fiber of Kazakh heavy draught crossbred horse increases till the horse age is 2.5 years old. For example, the diameter reaches 39.1 μm at 7 to 8 months old age, 45.3 μm at 1.5 years old age, 45.3 μm at 2.5 years old age for above breed, while this parameter is 42.8 μm , 49.4 μm and 48.0 μm at 7 to 8 months, 1.5 years old and 2.5 years old ages respectively for Jabe horses, and it was concluded that the diameter of muscular fiber for this breed increase till 1.5 years old age.

S.Rzabaev (1973) investigated the diameter of muscular fiber of both Kushum and Jabe horses with their ageing and seasons. Diameter of longissimus dorsi muscle fiber of Kushum breed horse is 33.7±1,01 μm at 1.5 years old age, and 39,5±0,87 μm at 3.5 years old age, while in Jabe horse it is 30,5±1,35 μm and 40,2±0,77 μm respectively at the same ages as above.

J.Gungaa (1978) studied the muscular fiber thickness of Mongolian horse meat and informed the fiber diameters of deltoid, longissimus dorsi and biceps femoris muscles of six years old horse are $39,4\pm 0,5 \mu\text{m}$, $42,7\pm 0,8 \mu\text{m}$ and $42,0\pm 0,4 \mu\text{m}$ respectively. T.Saipolda investigated changes of muscular fiber diameter of Mongolian horse with ageing.

Table 4. Diameter of muscular fiber (micrometer - μm)

Horse age /months/	Muscle names		
	Deltoid muscle	Longissimus dorsi	Biceps femoris
Two years old /18/	$31,6\pm 0,42$	$34,4\pm 0,53$	$33,1\pm 0,62$
Three years old /30/	$35,0\pm 0,54$	$37,1\pm 0,61$	$36,2\pm 0,59$
Four years old /42/	$37,5\pm 0,6$	$39,2\pm 0,72$	$39,6\pm 0,63$
Five years old /54/	$39,6\pm 0,78$	$43,0\pm 0,63$	$41,8\pm 0,74$
mature /16 years old/	$42,8\pm 0,29$	$46,1\pm 0,47$	$45,9\pm 0,34$

Above table shows the older the age of horse, the thicker the muscular fiber and diameter of the muscular fibers differs with muscle types. The fiber diameter of deltoid, longissimus dorsi and biceps femoris muscles in horses increases by 1.1, 1.08 and 1.09 times respectively from 2 to 3 years old ages, 1.07, 1.06 and 1.09 times respectively from 3 to 4 years old age, 1.05, 1.09 and 1.05 times respectively from 4 to 5 years old ages, and 1.35, 1.34 and 1.8 times respectively from 2 to 16 years old ages. Muscular fiber increase takes place most intensively at 18 to 30 months old age as compared to those in other age groups. It coincides with more intensive period of meat growth rate.

Some results of study on chemical constituents of Mongolian horse meat demonstrate proteins, fat, moisture, ash and caloric value of each kg for meat of 6 years old horse with medium fattening level are 21,40%, 13,5%, 63,4% 0,85%, and 9139,15 kJ respectively.

As well, results of study in association with ageing by T.Saipolda are summarized in below table.

Table 5. Chemical constituents of horse meat,

Parameters	Age /months/			
	Two years old /18/	Three years old /30/	Four years old /42/	Five months old /54/
Moisture, %	68,4	63,8	62,7	63,2
Dry matter, %	31,6	36,2	37,3	36,8
Fat, %	11,6	14,1	15,8	18,0
Protein, %	18,9	20,9	20,3	17,8
Ash, %	1,1	1,2	1,2	1,0
Caloric value,	7783,9	9107,38	9680,04	10128,14

kJ				
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Despite relative percentage of fat increases with ageing according to chemical principles of meat of grazing Mongolian horse, proteins are maintained at optimal ratio. Essential amino acid contents in Mongolian horse meat are higher.

Milk productivity of Mongolian horse. More attentions are being paid on physical and chemical properties and amino acid contents of Mongolian mare whole and fermented milks, microbial compositions of starter, and therapeutic values of mare fermented milk. Fermented mares milk is used as a traditional consumption of Mongolian people. Various products are made from other animal milk, while horse milk is mostly used for making fermented milk and broader therapeutic applications.

Milk yield from Mongolian horse depends on daily frequency of milking. Daily milking 6 times at 2 hours interval allows production of 2.5 to 3.5 liter milk. Mare milk depends greatly from the animal age and daily milking frequencies.

Table 6. Dependence of average daily milk yield of Darkhad and other strain mares from milking length and frequency

Foaling	Strain	Milking frequency				
		10 times at 1 hour interval	8 times at 1.5 hour interval	7 times at 2 hours interval	5 times at 3 hours interval	4 times at 4 hours interval
First foaling	Darkhad	4020	3233	2866	2053	1636
	Others	3610	3020	2510	1920	1240
3 rd or 4 th foaling	Darkhad	5123	4856	4226	3010	2356
	Others	4500	4040	3520	2780	2410
5 th or 6 th foaling	Darkhad	7066	6463	5563	4020	3130
	Others	4810	4310	3810	3240	2540
7 th or 8 th foaling	Darkhad	8756	7413	6340	4553	3446
	Others	5420	5100	4650	4060	3470
Average	Darkhad	62,41	5491	4748	3409	2642
	Others	4585	4117	3622	3000	2415
Difference		1656	1374	1126	409	227

Daily 10 times milking at an hour interval allows production of twice greater milk than daily 5 times milking at 3 hours intervals.

Selection of optimal frequency of milking mares is a key factor for mares milk yield, fattening level and successful wintering. Chemical constituents of Mongolian mares milk differ slightly between localizations of forest steppe, steppe and Gobi regions. Studies by R. Indra revealed that milk of Khangai region mares contains 2,1% fat, 7,1% lactose, 2,2% crude

protein, 1,3% casein, and 75,4 mg/l vitamin C, whereas Gobi region mares milk contains 2,4%, 7,0%, 3,1%, казеин 1,72%, and 73,2 mg/l respectively.

Essential amino acids account for 51.4% of total amino acids and unsaturated fatty acids represent 58.6 to 69.5% of milk fat for Mongolian horse milk.

Fat, lactose, crude protein and alcohol contents of fermented mare's milk are 1,9 to 2,1%, 2,1 to 2,8%, 1,8 to 2,8%, and 1,5 to 2,2% depending on regional climatic features. Total acidity is 94 to 106.8⁰T.

Alfa-lacto albumin, beta-alfa globulin and immunoglobulin of fermented mares milk are 41.9%, 35.0% and 17.9%. It is clear that fermented mares milk contain a number of matters with therapeutic values.

Reproduction of Mongolian horses. It is seen that mares account for 35 to 40% of total horse populations and each stallion inseminates 12 to 15 mares in Mongolia, where pasture based animal husbandry prevails. Entire gestational length is 11 months. It is seen that Mongolian breed mares at 2 or 3 years old age and stallions at 4 or 5 years old age are suitable for breeding. Mongolian breed stallions and mares are used for 15 to 16 years and 17 to 18 years respectively for breeding purposes.

Under pasture grazing condition, insemination of mares takes place in May through July. Conceived mares should be thoroughly protected for their pregnancies during winter and spring seasons. Ratio between stallion and mares should be 1: 5 or 6 for colt used first time for insemination or those used for racing, and 1: 10 to 15 for mature breeding stallions.

In pastoral horse husbandry practices, it is seen to be suitable, if 3 to 5 years old mares account for 18 to 20% of all mares, 6 to 14 years old mares, which are most fecund, for 70 to 75%, and mare above 15 years old age for 5 to 8%. Final decision to use stallion for breeding of more mares is based on observations and judgment of its first offspring raising. Breeding season of Mongolian mares commences during April and continues in May and June. Mongolian breed mare carries its fetus for 340 days in average and foaling occurs mostly in April and May.

In pasture condition of Mongolia, 70 to 72 foals are born per 100 heads of mares.

Behavior and pasture use of Mongolian horse. Many behavioral patterns of Mongolian horses are more obvious than other breed horses. Such behaviors include protection and love of won offspring or mother, sociability, unfriendly relation each to others, cherishing own native lands, selection and acclimatization of pasture areas, return to their home lands from far distant areas, prediction of sudden changes of nature and climate, avoiding from coming threats, stallions share of certain number of mares, stallion's subtraction of own female offspring and extra mares of various age group from its own harem, protection and fight of own harem against enemies, driving out or in geldings, recognition of the first owner and easy adaptation to various work or activities (M.Davaa, 2010).

Mongolian horses are raised on open pasture all year round. Mongolian horses are capable of grazing normally, when air temperatures range between 8⁰C and 18⁰C and wind speed is 8 to 7 m/sec. Wind speed affects adversely on grazing patterns of horses. Horses

can graze normally on the pasture during almost windless day with air temperature from -29°C to -30°C, but grazing becomes difficult when wind velocity reach 12 m/sec at temperatures from -14°C to -20°C.

Mongolian horse is capable of grazing freely on pastures covered with in average 22 cm thick (from 10 to 41 cm) snow with 0.27 g/cm³ density (not hardened). However, horse are fully unable to graze on pasture covered with 45 cm thick snow hardened to 0.45 g/cm³ density.

Mongolian horse grazing on pasture spends 53.3 to 76.0% of total time period of whole day for eating, 7.0 to 17.0% for standing idle, 1.5 to 4.3% for sleeping, 10.0 to 21.0% for reaching pasture and water, and 1.0 to 8.0% for protecting from insect bite and itching own body. Mongolian horse eats daily 11.8 to 12.4 kg feedstuffs converted into air dry state, from the pasture. It was shown that a horse eats 51.12 to 54.9 kg green plants on the pasture during summer (from June through August).

Capability of Mongolian horse for riding and work. Mongolian horse is significantly better with endurance and usefulness in riding and work in terms of body weight as compared to other breeds of horses. Mongolian horse is able to carry loads on its back, which is equal to one third of its own body weight for far distance, whereas thoroughbred or foreign breed horses with larger body are unable to do such (Bekterev, 1945). Mongolian horse can carry 960 to 1440 kg loads on its own back and carrying coefficient is 3.0 to 4.8 (Grekhov, 1933). Mongolian horses used to overcome 4800 km distance for 90 days and 2800 km for 40 days.

Race horse and its selection. Main symbolic example of Mongolian people respect, love and worship to horses is that horse figure is illustrated in the coat of arms of Mongolia, as well as state ceremony and honorary white banner and army black banner are made from horse tail hair.

Various issues of Mongolian culture, arts and custom, as well as many fields of sciences related to horse selection, training, conditioning, curative bloodletting etc. and civilization were arisen in regard to horse racing activities by Mongols.

Although Mongolian people prefer livestock body conformation and constitutions for each types, they performed the most complex observations and experiments on the horse, saw them in terms of its use making a number of classifications, and created extensive writings and literatures on these issues. Some of the ancient writings are commonly clear, but some are rather confidential by keeping only within lineage of people. Publications by scientists summarizing such extensive literatures demonstrate judging approach for evaluating racing capabilities of Mongolian horse with external, internal and hidden signs has been transferred through the centuries. Both external and internal signs are divided into below mentioned 10 classes:

- 1.Head feature
- 2.Hoof feature
- 3.Tail feature
- 4.Vocal feature
- 6.Trace feature

6. Water feature
7. Eating feature
8. Teeth feature
9. Tendon feature
10. Entire body feature

From these features, it was emphasized that race horses should be evaluated not only with body conformations and constitutions, but also with abilities of using water and nutrients, which are key factors of horse training and conditioning.

Head feature. Head of any livestock is seen to be main part of identification of main character, productivity and body constitution types of certain breed, while it is a body region to be used by Mongols for judging horse racing performance at first. Mongolian herders judgment of horse body and head shapes with shapes of any animals in association with their closest relations to nature and earth is different from other nations. For example, there are descriptions of horse head shape in comparison with that of sheep, hare, musk deer, frog and predator animals. Among them, if horse head shape resembles hare and frog heads, it is seen to be better. In the head region of race horse, besides of shapes and sizes of eyes, forehead, mouth, nostril, muzzle and ears, broader tongue bed and hollow between both mandibular bones, longer and curved nose, triangular eyebrows, generally larger, pointed, thin head, longer mandibles than upper jaws are seen to be better features.

Hoof feature. Hooves are evaluated as mussel, cup, balk, flesh, yak and bird nail like shaped on the basis of hoof's external shapes and frog localization. Hooves, shaped like yaks hooves are believed the best. Such hooves are thick, short, curved around brims and slightly oval, and breach toward heel, deep frog and typical shape is not so wide, but large. If fetlock is goose like, it is better. Goose like fetlock which erects in racing is good. If hoof strips are transverse and straight, it is seen to be better.

Tail feature. If tail bone is longer, hairs are thick, but sparse at the end, it is seen to be suitable. Long and thick or short and thin tails are fair, thin and long tail is believed to be worse. If tail bone reaches hip point, when it is pulled to anterior direction, it is better.

Vocal feature. It is necessary to hear very well the sounds during horse whinny. If horse whinny with nose like boar is seen to be worse, if it sounds like predator animal chunking, it is fair sign, and if the horse whinny is shrill, intensive and clear like lark clucking, it is good.

Eating feature. A skill of Mongolian horse trainers is that main observation during race horse training adjustment is based on horse feces. Horse trainers see it is good if horse eats lot and it feces are less, and it is worse if horse eats less and feces are abundant. It is believed the selection is made in association with digestibility of nutrients of feedstuffs.

Water features. It is worse if horse drinks water continuously at once. It is better if horse drinks water many times at several rests.

Trace feature. If traces of hooves on the earth except of hoof brims are not clear, it is seen to be good. If traces of foreleg feet are in front of the hind leg feet traces, it is worse. It is fair, if horse hind leg feet trace are in front of foreleg feet traces, when horse walks.

Coincidence of traces of both fore and hind leg hooves or traces of hind leg hooves exterior to traces of both foreleg hooves are seen to be excellent sign.

Tendon feature. It is good, if tendons are strong like bowstring, but flexible. The sign very important for the tendons is tendons on cannon bone. If the area is that space between two fingertips are closer, the horse is seen to have strong tendons. Horses with weak tendons easily suffer from leg injuries, whereas horse with strong tendons is capable of racing for many years not suffering from leg injuries.

Teeth feature. Horse teeth are described with various categorizations in ancient writings. Horse teeth are categorized as aisled teeth, sheep teeth, wheat teeth, boar teeth and chicken teeth. Also each teeth categories are classified into 13 parts. Among them, teeth with bulging gums, dental crown hollow is wide as it includes a whole grain, oval and deep dentine, wider spaces between the teeth, spread out and shorter teeth are seen to be better sign. It is concluded that larger canine like bull camel canine and spread out are not good sign.

Entire body feature. If head is like elk head, four cannons are like red deer legs, hocks are long, pasterns resemble sheep's pastern, body is argali like, neck is long, withers resemble camel hump, breast is very prominent, scapula is slant and long, ribs are long and wide, curved almost no spaces between ribs, belly is large, closest distance between short rib and hip point, longer and slant croup, broader distance between hind legs, and narrow flank, the horse is capable of racing. As well, it is better, if shoulder and thigh muscles are prominent, cannon bone is thin and flat, skin of entire body is thin and loose, larger flank, skin of armpit is crimped, four legs massive and out treaded, joints are larger and ball like, head is not so elevated, distance between breast and withers is far, last rib cartilage is prominent and situated in front of thigh and hip. Horse, head of which is elevated, thorax is high, and lower croup is worse to gallop toward higher area seeing the mountain, while horse with declined heads, and strong croups and chest is worse to gallop toward lower area.

Internal signs. Racing performance of horse is described with the development of some organs. These are as follows:

1.Heart feature. The horse not frightening from road difficulties and with higher endurance and good heart has reddish black or brown eyes, ears which are thicker on their base and move regularly in riding. Grey eyes and narrow non-erect ears and acute eyesight are believed to be signs of worse heart.

2.Lung feature. Lung capacity is seen with nostrils and muzzle. Larger nostril is better sign. It is good if the nostril is long like slit in calm state, while it becomes broader like horn music when the horse breathes much.

3.Kidney feature. It is better, if kidneys are small. Ears of horse with such kidneys is thicker in their base, longer as a whole, tips are pointed, and cavity is larger. It is seen that kidneys are larger, if ears are oval.

4.Liver feature. Liver is judged with tongue conditions. It is seen to be better if liver is small. Tongue of such horse is thin, white color and longer. If tongue is red and shorter, liver is not good for far distance race.

5.Spleen feature. Spleen features are seen to be found in dental gums. It is better, if spleen is small. Gum of the horse with small spleen is stunted, while it is puffed up and thick, if the spleen is large.

Conclusions

1.Mongolian horses belong to independent breed of horses with specific characteristics maintaining unique biological traits developed as a result of folk selection under specific natural and climatic conditions with four seasons different from each others.

2.Above literature reviews reveal studies of these unique biological and economic characters of Mongolian horse are still not performed at sufficiently high level. Therefore, research on genetic and biological peculiarities of Mongolian horse at molecular biological level in collaboration with overseas scientists will open the possibilities of solving a number of theoretical and practical issues.

3.It is necessary to advance genetic and biochemical research, which scientifically conform the origin of Mongolian horse, and external and internal signs for judgment of racing performance of Mongolian horse, which were inherited in Mongolia for the centuries.