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AN ETHOLOGICAL STUDY OF YOUNG HORSES

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Abstract

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In the present study called "An Ethological Study of Young Horses" we focused on the behaviour of foals from their birth to separation from their mother. We observed and analysed their behaviour and daily activities, and from the achieved results we drew conclusions for practical horse breeding. We studied the following forms of behaviour of the foals: feeding behaviour (sucking, drinking, eating roughage and concentrates, gleaning, coprophagia), defecation and micturition, comfortable behaviour and mutual comfort behaviour, manifestations of relaxation (resting posture, lying down), movement manifestations, playful behaviour, stereotype behaviour, other manifestations (acoustic, olfactory etc).
As a result we recommended several changes in the technology, e.g. larger stables, salt-lick out of reach of the foals, more frequent exchange of bedding, shelter for horses grazing in the open.

behaviour, foal, technology, daily activities

In terms of ethology, animal and human behaviour is a function of the organism. The organism is a system, the existence and specific form of which are the result of historical development (Lorenz, 2000). Veselovský (1992) indicated that behaviour is the result of continuous interaction of genetic and environmental factors (the genotype governs the pattern of behaviour and the environment the span of this character).

The environment has a considerable effect on the health condition and performance of animals. The "welfare" system is a form of technology, which creates optimal life conditions for the animal using the faculty of the animals to adapt to a certain environment (Hrouz, Šubrt; 2000). The breeder's duty is to ensure the animals an environment respecting their demands (e.g. corresponding quality of air, water, feed, housing with sufficient space for each animal, veterinary care etc.). The animals should also avail of the company of animals of their own species, as this will allow them to behave normally (Webster, 1999). It is important that the housing systems are in keeping with the natural demands of the horses and that they are up to the standards of animal welfare (Navrátil, 1999).

The foals are usually born at night; 15 minutes after birth the foal tries to stand up and nurse (Dražan, 2001). The first movement of the bowels (passing of the so-called bowel meconium) is very important in the first hours of the foal's life.

Dušek et al. (1992) pointed out that the development of the foal was always focused on its ability to escape danger by quickly running away. A healthy foal stands up very soon after birth; it sucks milk as often as 50 times a day and the total milk consumption is 10–20 l; these small portions of milk do not burden the digestive tract of the running foal.

Among the essential properties of living organisms is their ability to communicate and exchange information with the environment (Mills, Nankervis; 1999). The number of horses in a natural herd usually consists of not more than 20 individuals and the animals recognise each other very well (Víchová, 1997). A typical body odour distinguishes the groups of horses (Edwards, 1992). After birth the foal has no sense of social order and the mother carefully watches over it (Dušek, 1999). The foal communicates first with its mother, then with the other foals and horses in the herd. During the first weeks the foal feeds mother's

milk only, and then it tries to imitate its mother and begins to eat, drink water and learn to graze. Typical of foals is that they are playful and curious. Their curiosity enables them to get to know the environment very closely and using inherited experience to increase their chance of survival (Franck, 1996).

Weaning is the first great stress and crucial period for the foals. Today the foals are weaned at approximately 6 months of age. The stress factors are separation from their mother, changed environment, nutrition, daily regime etc. Group weaning of the foals is preferable at the same time or in very short intervals, because very soon after weaning the herd is divided sociologically. If the foal joins the already formed herd later, the herd refuses to receive it (Hauptmann et al., 1972). The stress of weaning should be reduced as much as possible so as not to disturb the process of rearing (Misař, 1992).

The objective of the present study was to observe the life manifestations and daily activities of foals (from birth to weaning), the process, frequency and associations: then to analyse these manifestations and to draw conclusions for practice.

MATERIAL AND METHODS

Our study was conducted in the herd of Czech warm-blooded horses at Velké Němčice. The acreage of the farm is 45 ha, of which 5 ha are horse runs and pastures. The herd has approximately 40 horses, including foals. The mares with their foals are housed in free stables. During foaling, and shortly after, the mothers and foals are kept in 3×4 m sized foaling boxes and then they again join the herd.

The results were obtained in two stages; the first stage ran in 2000 (1st group of foals) and the second in 2001 (2nd group of foals). Each group consisted of 4 foals and each foal was indicated accurately in the order of birth, initial letter of its mother's name and according to sex (e.g. 2S♀ = filly of the mother Svita, born second in the year). Both groups of foals were observed every month on a regular basis (4 h in the morning and 4 h in the afternoon), from birth to weaning, either in a grass-covered run adjacent to the stables (2.5 ha), or in a free stable for mares with foals (ca 9×12 m), as the weather permitted. The observation places were selected so as not to disturb the horses but to give the best possible view (through a window recess in the stable and outside in the run using binoculars).

The data were recorded in ethograms (continuous record) and then elaborated by mathematical-statistical methods using means, graphs and tables. This ethological work is not based on statistical evaluation, but on monitoring of the individual animals within the groups. That is why no other statistical values were observed and the significant differences in activities of the individual animals are specified in the text.

The following forms of behaviour of the foals were analysed:

1. *Feeding behaviour*
   a) *Sucking – oral intake of mother's milk by the foal,*
   b) *Feeding roughage and concentrates, and gleaning – oral intake of feed,*
   c) *Grazing – oral intake of grass on the pasture,*
   d) *Drinking – oral intake of water,*
   e) *Coprophagia – ungulates eating the excrements of other ungulates*
2. *Excretion*
   a) *Defecation – excretion of solid waste products of metabolism,*
   b) *Micturition (urination) – excretion of liquid waste products of metabolism*
3. *Comfortable behaviour (grooming), mutual grooming – body grooming*
4. *Resting*
   a) *Resting posture – relaxed posture of a resting horse,*
   b) *Lying down – intensive form of rest when the animal is lying down*
5. *Movements – movement of the horse in one place or around the space*
6. *Playful behaviour – behaviour for the purpose of playing and socialisation of the young*
7. *Stereotypic behaviour – frequently repeated inadequate behaviour*
8. *Others – acoustic manifestations, olfactory manifestations, salt licking etc.*

RESULTS AND DISCUSSION

1. Feeding behaviour

a) Sucking. The amount and quality of the mother's milk, satiety, vitality and age of the foal, disturbances in the surrounding etc. influence the length and frequency of suckling.

In both groups the suckling frequency gradually decreased; in the first group of foals from the average of 2.12 times of suckling per hour in the first month of age to 0.37 suckling per hour before weaning. In the second group the suckling frequency was higher, ranging from the average 3.16 times of suckling per hour at the age of one month to 1.04 before weaning (for details see Tab. I). Although the groups differed in the suckling frequency per hour, in both cases the nursing bouts became shorter with increasing age. It was also influenced by the mare as she herself regulates the foal's intake of milk (e.g. by refusing the foal and pushing it away). The only complications were seen in the second group where the mother (blind in

one eye) of the foal (filly) refused nursing. Eventually the filly learned to suck only on the left (blind) side of the mother. With increasing age of the foals the intervals between nursing became longer. Suckling mutually motivated the foals, when one sucking foal motivated the others to suck.

I: *Course of the frequency of suckling of foals from birth to weaning*

Age of foal (months)	Average frequency of suckling per hour	
	1st group of foals	2nd group of foals
1	2.12	3.16
2	1.37	2.20
3	1.25	1.79
4	1.12	1.59
5	0.75	1.21
6	0.37	1.04

Tyler (1972) reported that the suckling frequency of the foal in the first month was twice an hour and at the age of five months 1 suckling per hour. Compared with our results the frequency in the first month corresponds with the 1st group of foals, while at the age of 5 months the frequencies were consistent in both groups.

Fraser (1980) reported another comparable datum, i.e. suckling frequency of 6-month old foals, which was 0.33–0.42 suckling/h, corresponding with results of the 1st group where suckling was 0.37 times per hour at the age of 6 months.

In his studies of Tb Duruttya (1993) discovered that the suckling frequency of 1-month old and 6-month old foals was 1.7 and 0.6–1.4 suckling per hour, respectively. In this case the author reported that the suckling frequency of 1-month old foals was lower than in our two groups, while suckling of 6-month old foals was comparable with the 2nd group of foals.

b) Eating. Eating is largely affected by how the administration of the feed is organised. Concentrates were given in troughs twice a day. From the first month of age the foals were tied near the trough and given additional feed during feeding time. They ate hay with their mothers and straw was always available in the form of bedding. Foals of the 1st and 2nd groups began to eat from the first month of age and with increasing age the time of feeding increased too. Limited amounts of concentrates were available twice a day but in the remaining time the foals had access to hay and straw.

In his studies of Tb Duruttya (1993) reported that the exclusive manifestation of feeding of 1-month foals was suckling. In our study however we saw that even in this period, when they were separately given additional feed, the foals were interested in the feed.

In the opinion of Dražan (2001) the uptake of feed in this early period is rather a pastime and an attempt of the foal to imitate its mother. However if the foal is constantly looking for feed it could mean that the mare does not have enough milk and that the foal is hungry. Taking up feed and insufficient lactation means that the foal requires drinking water. This observation was confirmed especially in the case of the abovementioned filly whose mother did not allow it to suck from its birth. This filly was constantly searching for food and drinking water from the age of 3 months.

Hawkes et al (1985) explored the roughage preferences of ponies. They preferred green fodder over hay. In our studies the result was reverse. Whenever a bale of hay was available at the pasture, all the mares and foals took to hay. This preference is no doubt also dependent on the quality and palatability of the hay and pasture, which may change from time to time.

An integral part of the feeding behaviour is the so-called gleaning when the horse plays with tufts of hay or straw, sniffing at them, now and then eating a stalk. One factor, which also influences eating, is the time the foals spend in the stable (after coming back from pasture the period of gleaning decreased in contrast to when the foals were kept in the stable all day long), cleanness of the bedding, age of the foal etc. Gleaning was seen in the stable only, in both groups from the age of one month.

Studies on gleaning are few and far between. Authors agree with the conclusions according to which this behaviour can be seen in all age categories, save foals before weaning. In our study this opinion was not confirmed; Dražan (2001) also denied this claim and observed such behaviour of foals as early as two months of age.

c) Grazing. The horses grazed outdoors on pasture adjacent to the stables, as the weather permitted. Since most of the foals were born in winter, they remained in the stables during the first two months. We did not monitor grazing until the 3rd month of age when foals of the first group grazed 59.7% of the monitored time. In the following months the period of grazing

gradually increased to 68.7%, 71.8% and 72.9% of the time of monitoring. Foals of the 2nd group devoted less time to grazing, i.e. in the 3rd month of age 37.5% of the monitored time and in the following months it increased to 39.2%, 40.9% and 48.4%, respectively. In both cases we saw an increasing trend (see Table No. II).

II: *The course of grazing of the foals*

Age of foal (months)	Period of grazing in % of the observed time	
	1st group of foals	2nd group of foals
3	59.7	37.5
4	68.7	39.2
5	71.8	40.9
6	72.9	48.4

The differences between the groups may be due to the quality of the pasture because in all cases the foals of the 1st group devoted more time to grazing and less time to suckling, and in the 2nd group it was the other way round.

Sharon et al. (1985) reported that foals began to graze as early as the first week of age. Tyler (1972) drew the same conclusions. We cannot give our opinion on these data as our observations were carried out from the age of 3 months, as mentioned above.

A number of authors monitored the period of grazing. Sharon et al (1985) discovered that out of the total period spent outdoors the foals devoted 70% to grazing. Hauptmann et al. (1972) reported the same results, unfortunately without stating the exact age of the foals. The above datum corresponds with our results for the 1st group of foals of 4, 5 and 6 months of age.

Duruttya (1993) studied Tb foals of 6 months of age and came to the conclusion that the foals devoted 30–60% of the time spent on the pasture to grazing, what corresponds with the 2nd group of foals in our investigations.

d) Drinking. In our study the 1st group of foals did not drink water at all during the period of our observations (but because we did not monitor the foals 24 hours, it can be assumed that a single foal drinking now and then might have escaped our attention). In the 2nd group of foals the odd foal did drink water from 3 months of age. We had only automatic water feeders what is not ideal for foals because of the height at which they are placed. Much better would be a pail with clean water. Although foals drank from the feeders, they did not fill them.

Schönholzer (1959), Hassenberg (1971), Schäfer (1974) and other authors explored the ethology of drinking of foals, and they all agreed that first of all the foals must learn to drink water. According to Ihle (1984) the first attempts at drinking water begin at 4 months of age, but complete drinking of water can be seen at the age of 2–4 months; in our observations it was from 3 months of age in the 2nd group of foals. We found no data on how frequently the foals drank water so we could not make comparisons. Only Duruttya (1993) mentioned that Tb foals at the age of 6 months drank water rarely.

e) Coprophagia. It means that the ungulate eat the faeces. Duruttya (2005) mentions, in most cases foal consumes fresh excrements of its mother. The reason of this behaviour is that it is the only source of vitamines and other substances which it can not synthetize in early age. That is the reason that coprophagy does not mostly occur in foals in higher age. We reported coprophagia in two foals. In both cases it was in the first month of age and only inside the stable.

Francis-Smith and Wood-Gush (1977) confirmed that coprophagia occurred primarily during the first five months. Ihle (1984) reported the first case of coprophagia in foals on the fifth day after birth. At the age of five months this behaviour virtually disappeared.

2. Excretion

Urination and defecation is affected by the frequency and intensity of suckling, the sort and amount of feed taken in, fear etc. Some authors mentioned the relation between defecation and the sex when stallions were seen to defecate 3 times more frequently than mares.

a) Defecation. The frequency of defecation from birth to weaning was approximately at the same level (0.13–0.37 times/1h) for colts and fillies, and in both groups. The above mentioned difference in the frequency of defecation between stallions and mares evidently applies only to sexually mature animals.

b) Micturition (urination). In our study the frequen-

cy of urination slightly decreased with the age of the foals and the values were stabilised when the foals began to eat fodder. Between the 3rd and 4th month the frequency of urination was once in 2–3 hours and was the same in stables and on pastures.

Hauptmann et al. (1972) stated that the frequency of urination was 5×–8× and more a day and defecation 5×–10× a day, what approximately corresponds with our results (the author did not state the exact age of the horses).

3. Comfort behaviour

This behaviour has a seasonal pattern, which corresponds with the highest incidence of stinging insects and most probably with the annual moult. In the first group the frequency of comfort behaviour, such as scratching, rubbing against objects etc., ranged from the average 0.38/1 h to 2.63/1 h. In the second group the situation was more stable ranging between 0.79/1 h and 1.13/1 h (see Table No. III). This behaviour also corresponds with the incidence of internal parasites. In the period before weaning, when worming the foals is highly necessary, the frequency of rubbing its rump against various objects markedly increased.

Mutual comfort behaviour is a form of social behaviour of horses. It was observed regularly (in the 1st group of foals from the age of two months and in the 2nd group as early as from the first month) first as bouts of mutual grooming with the mother, later also with their contemporaries. Table No. III shows the course and frequency of comfort behaviour of foals from birth to weaning.

III: *The course of comfort behaviour of foals.*

Age of foals (months)	Average frequency of comfort behaviour per hour			
	Comfort behaviour		Mutual comfort behaviour	
	1st group	2nd group	1st group	2nd group
1	0.38	0.83	0.00	0.13
2	0.88	0.88	0.25	0.17
3	1.13	0.79	0.63	0.42
4	2.52	0.84	0.88	0.47
5	2.63	1.13	0.88	0.28
6	2.25	1.00	0.88	0.25

We found data on comfort behaviour of foals only in the work of Duruttya (1993) who reported that it was rare in foals, and only in the form of grooming its own body, completely differing from our studies.

The preference for certain partners during mutual comfort behaviour was not confirmed, obviously also because our group of animals was small.

4. Manifestations of relaxation

Inside the stable the foals relaxed in the form of a *resting posture* for approximately the same period of time as on the pasture; however, they *lied down* only inside the stable (on the pasture we reported a rare occasion when one colt (4N♂) lied down because it had injured its pelvic limb). The filly, whose mother was at the bottom of the hierarchy scale of the herd and was frequently attacked and driven away, spent the shortest time resting in the stable. The quality of the bedding is sometimes a problem. This assumption is based on the observed behaviour of the foal; after returning to the stable from the run it stands in a resting posture, paws the litter with its front leg, sniffs at it, but does not lie down; and if it does, after a while it gets up again and drowses. This situation was often repeated. On clean bedding the foals lied down much more frequently and for a longer period. How much time the foals devoted to resting and in what form is shown in Table No. IV.

IV: *Resting manifestations of foals from birth to weaning*

Age of foals (months)	Period of resting posture (% of the observation time)		Period of lying down (% of the observation time)	
	1st group	2nd group	1st group	2nd group
1	33.0	21.9	43	28
2	42.7	23.9	41	15
3	23.9	21.2	33	18
4	17.7	18.2	grazing	22
5	16.7	20.6	grazing	grazing
6	10.4	19.8	grazing	grazing

Duruttya (1993) observed Tb foals and his results differ from ours. He found that out of the 24 hours the one-month-old foals in the stable devoted 42.9% of the time to sleeping and 7.3% to lying down; and at the age of 6 months they devoted 10.6–33.2 % of the time to lying down and 0.7–8.8 % to a resting posture when inside the stable, and 0.1–1 % of the time to lying down (sporadic) and 0.3–1 % to a resting posture when grazing.

5.,6. Locomotive and playful manifestations

The locomotive activity of the foals is closely associated with the locomotive activity of the mother, with the daily regime, age of the foal, concentration of animals in the given space, size of this space, hierarchic position of the mother within the herd, with disturbing effects of the surroundings, with the health condition of the foal etc.

When the herd was let out into the run, their movements were very dynamic, but gradually the animals calmed down and usually within 10 minutes the mares and foals were grazing peacefully. Generally the horses moved over the pasture at a walking pace. We did not discover a dependence of the frequency of movements on the age of the foals (with increasing age the frequency did not increase nor did it increase, but rather fluctuated). We confirmed the association between the locomotive activity and hierarchic position of the mother (particularly inside the stable) where the mother-foal couple of lower standing was often driven away and chased.

Other movements of foals are various forms of play. This behaviour has a social character and is very important for the future standing of the individual in the herd. The foal first plays with its mother and then with other foals. The movement and play manifestations of the foals took place much of the time on the pasture and after coming back to the stable they were considerably subdued and the foals preferred to rest. The focus of our observations was on foals playing with other foals, which were not reported until three months of age in the 1st groups of foals and as early as the first month in the 2nd group. The average hourly frequencies did not considerably change with increasing age. In the 1st group the average number of times the foals from 3 months of age sought a partner to play with was 1.23/1 h, in the 2nd group it was 0.33/1 h as early as from the age of one month.

In the 2nd group of foals we noticed that two colts (1S♂ and 4N♂) preferred to play with their partners. Although their age difference was three months (most of all the group) on the pasture they played and indulged in fighting, which consisted of mutual biting, rearing up etc. ending up by bolting away, kicking and chasing each other.

Tyler (1972) and Carson (1983) reported that at the age of 4 months social play with other foals tend to be quite frequent; the colts are more aggressive than fillies of the same age. “Combat games” are exclusively the business of colts.

7. Stereotypic behaviour

We did not monitor any stereotypic behaviour.

8. Other

Acoustic manifestations. The foal neighs and whinnies when it gets separated from its mother, when the attendant is approaching, when another horse returns to the stable, when feed is distributed, the 2R♀ filly was sometimes seen to neigh softly before suckling. These manifestations are frequent, but irregular and they correspond with the findings of Schäfer (1978) who reported that horses have many acoustic signals dependent on the circumstances, which evoke it, and on the individuality of the animal.

Olfactory manifestations. One of the manifestations, which we monitored, was the so-called “flehmen” response or “lip curl”. The horse curls the upper lip back and exposes its teeth. The reasons for such behaviour are various, e.g. the detection of some unusual smell or odour. Both colts and fillies engaged in this behaviour.

Hassenbergová (1971) discovered the flehmen response in all the studied breeds of ungulates of all age categories and both sexes.

Salt licking, coughing, snorting etc. – this behaviour was detected only sporadically.

CONCLUSIONS

The technology and method of horse rearing must be consistent with their demands and with the principles of animal welfare. As we discovered the most suitable type of housing mares with foals was a free stable. The foals lived permanently in the group together with their contemporaries and were able to develop their social behaviour to a full extent. However, this space was not sufficient when more animals were concentrated and we saw collisions among the mares, when the mare at the bottom of the hierarchical scale was attacked and often had no sufficient space for resting with her foal. We recommend to extend the space of the stable or to reduce the number of mares with foals in the group. As mentioned above, in our experiment we had problems with the cleanness of bedding in the stable (deep bedding). Remedy is easy – to change the straw more frequently.

In connection with good hygienic conditions and prevention of the animals, it is necessary to conduct timely worming of the foals. Before worming we saw

heavy coughing, snorting and intensive efforts to rub their behinds against objects. We recommend more frequent and thorough worming on a base of coprological analysis of excrements and actual level of external parasite development stages on pasture.

Ethological studies of the behaviour of the herd point at other shortcomings as well. In our studies one situation was often repeated; on bright summer days the foals lost interest in grazing and sought shelter. Since there was no shelter or tree on the pasture, the foals hid in the shade of their mothers. In hot weather most of the horses suffered from eye discharge. The breeder should draw appropriate conclusions from this fact and build a shelter or re-organise the grazing schedule. Grazing horses should have a sufficient supply of drinking water and the foals should have a pail with clean water available in the stable, because drinkers are unsuitable for foals in the period when they are changing over from mother's milk to solid feed and water.

SOUHRN

Etologická studie mladých koní

U kategorie hříbat od narození do odstavu jsme sledovali jejich chování a denní aktivity, které jsme následně analyzovali. Z dosažených výsledků jsme vyvodili závěry pro praxi. Sledovali jsme tyto formy chování hříbat: potravní chování (sání, žraní objemných a jadrných krmiv, pití, paběrkování, koprofagie), kálení a močení, komfortní a vzájemné komfortní chování, odpočinkové projevy (klidový postoj, ležení), pohybové projevy, hravé chování, stereotypie a další (akustické, olfaktorické projevy apod.). Po vyhodnocení celé studie jsme doporučili několik změn vztahujících se k technologii (např. rozšíření volné stáje pro klisny s hříbaty, častější výměnu podestýlky, včasné a pečlivé odčervování koní na základě koprologického rozboru trusu, zbudování přístřešku a napajedla pro koně na pastvině apod.).

chování, hříbě, technologie, denní aktivity

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