

Maternal behaviour in mares

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Summary

The strength of mare-foal bonding can be measured through quantification of behaviors such as the frequency and duration of nursing bouts, mutual grooming, elements of normal maternal aggression and the prevalence of activities maintaining the proximity between mare and foal. Most of foalings take place at night. Shortly after parturition olfaction and taste, coupled with the hormonal and physical events, result in the identification of the foal by its dam. The mare's attachment to her neonate is formed within the first few hours after delivery, while the formation of a bond linking the foal to its dam takes place after a few days. Mares often help their newborns to find the udder; however, they usually terminate nursing bouts, which confirm the parent-offspring conflict theory. Horses have been classified as „followers”; in the first days after foaling the dam teaches her neonate the following response by rejection behavior. Changes in mare's behavior significantly affect the form and frequency of social interaction between the dam and the other members of a group. Moderate aggression directed towards her own foal, other horses and humans is a part of normal maternal behavior.

Keywords: maternal behavior, mare, foal

Care provided by a dam from birth to 110 days of a neonate's life is essential for a foal's survival (11). Typical qualities of maternal behavior belong to those behaviors that, despite domestication, in most cases remained unchanged. Both in wild and domesticated animals the breeding behavior model is a pattern that was formed during the phylogenetic development of the individual species. The environment can only cause exceptions to the basic pattern, leading sometimes to pathology (22). The strength of the attachment and social bond between mare and foal can be measured through the quantification of behaviors, such as the frequency and duration of nursing bouts, mutual grooming, elements of normal maternal aggression and the prevalence of activities functioning to maintain proximity between mare and foal (21). Research on maternal behavior allows a better understanding of mares' needs after parturition (7).

Delivery

For animals that do not give birth to their young in a nest, the process of delivery must have been subjected to a particularly heavy selection pressure. Thus, any circadian rhythm is likely to have been of some adaptive significance. The most of the foalings take place at night: 86% occur between 7 p.m. and 7 a.m. with the maximal incidence between 10 and 11 p.m. (18). When the nights became shorter in the summer, the frequency

of foalings per hour of darkness increases. This suggests that light is the main controlling environmental factor. While births at night offer the greatest chance of concealment from predators, the labor accomplishment may be largely reduced by the fact that night is the time of greatest predator activity (18). Mares are able to delay or even interrupt the first stage of the delivery when adverse conditions occur (4).

Mare-foal bonding

The sight of a neonate immediately triggers maternity, which accumulated in the mare during pregnancy. Maternal instinct dictates her actions aimed at protecting and nursing the foal (15). Reflexes of attachment of the mare to her foal are visible in the first 15-30 minutes after foaling (20).

Postpartum maternal behavior divides into two phases: a general motivation for closeness and care of the neonate, and the specific identification of the newborn foal as its own. General maternal behavior is triggered by the fall in estrogen and progesterone and the view of a small, wet, uncoordinated neonate (12). The first interaction of a mare and foal is examining the newborn's head. This reaction resembles the greeting behavior of two adult horses (13). The contact between a dam and her neonate causes imprinting (22).

Licking the foal usually begins when the mare is standing. At the beginning licking is concentrated on fetal

membranes around the foal's head. This can prevent a neonate from being smothered by the fetal membranes (12). A mare can display interest in the amniotic fluid and discarded membranes as well but in contrast to other species domesticated horses rarely eat placenta (4, 9, 12). Next, the dam licks the foal's head, hindquarters and perianal area and, only later, she licks the center of the foal (12). On the other hand, Chavatte claims that a mare concentrates on licking the navel and the perianal area (4). Licking dries a foal's outer coat, stimulates blood circulation, stimulates the foal to breathe and encourages activity (13).

Licking time decreases with time after foaling. Only few mares lick their foals after two hours after parturition (12). Both long-term foal licking and the rapid disappearance of this activity over time help us understand how important the sense of taste is in the process of identification of the newborn (13). Specific identification is triggered by the cervical stimulation which occurs as the foal is delivered. Cervical stimulation triggers the release of oxytocin not only from the pituitary, but also into the olfactory bulb where nitric oxide and cyclic GMP potential glutamate are released at the mitral to granular cell synapse, thus signaling a critical period during which the encountered odor of the newborn will be remembered (12). In the process of licking her neonate, a mare deposits chemicals contained in her saliva, which are later used to help in the identification of her foal (6, 21). After the establishment of a specific mare-foal bond, a mare usually rejects attempts at suckling by any other foal (4, 6, 12).

Besides licking, maternal behavior consists of the following activities: nuzzling, grooming, avoiding stepping or laying on the newborn, enabling and facilitating nursing, protecting the neonate from intruders by positioning herself between the neonate and intruders even to the point of attacking or driving away intruders. These behaviors are the most intense in the first hours after parturition. Subsequently, the frequency of such behaviors falls during the first three days of the neonate's life, until a particular bond between the mare and her foal is established (9). The mare's attachment to her foal is formed within the first few hours after parturition, while the formation of a bond linking the foal to its mother takes place after a few days (13).

Nursing

Nursing is the most costly form of maternal care in mammals. Nutrient requirements of mares are especially heavy during this period. Mares with greater maternal experience target their investment in suckling to the first 20 days after parturition, which is the most critical period for foal survival (11). Behavioral measurements of lactation are useful to assess the level of maternal care (17).

Most of nursing sessions are initiated by foals (1). After birth and their first standing up, foals come up to the front of the dam's body trying to find a mare's teats in the forelegs area (20). When a neonate is seeking the

udder, it follows along any horizontal ledge, because under natural condition it would be only the mare's abdomen. This explains why foals in stalls and paddocks may follow along fences or other horizontal feature (9).

Multiparous mares often lead their foals and help them to find the teats (20). When a neonate stands up for the first time, a mare positions herself to allow easy access to the udder or even pushes a foal with its head in this direction (4, 15). The dam sometimes shifts her weight on the side and lifts her hindquarter on the side of nursing (4).

Being in close proximity to their dams, foals are able to nurse frequently (3). In the early part of lactation mares terminate nursing bouts (9). In the first month of a foal's life mares rarely display aggression against their offspring during nursing (5). Mares terminate nursing primarily by simply moving away while the foal is still nursing (5, 9). This fits well to the parent-offspring conflict theory, which says that an offspring tries to maximize its reproductive success and wants more investment than the parent can give (17). Frequency and duration of nursing bouts decline as foals matures (1). In natural herd conditions, a foal suckles until its dam foals again (3).

Following and recumbency response

Foals are precocious animals and in natural conditions they are able to stay close by their dams and travel with the herd from an early age. Horses were classified as „followers” because they can follow a dam soon after birth (3, 16, 22). Another group are cattle, pigs, sheep, goats. The young of these species wait for their mothers in hiding, so they were called „hidiers” (3, 22).

Mares recognize their foals immediately after parturition, whereas it takes 2 or 3 days for a foal to form a bond to its dam (3). At first the following response of the foal is indiscriminate, so they are able to follow any large moving object (14). Mares may teach foals to follow the dam by rejection behavior (9, 11, 13). They step away from the neonate while it is seeking the udder, even before the first nursing. This behavior is often understood by the owners as abnormal maternal behavior. It is suggested not to intervene by restraining or disciplining the mare because it may be counter-productive. Stepping away without aggressive kicking or biting is a part of normal maternal behavior (9).

When a foal is awake it maintains a certain proximity to its dam and follows the mare (14). On the other hand, like most neonates, foals need to sleep much longer than adult do (12). They lie down for 20 minutes every hour (14). A mare's reaction to a lying foal is a recumbency response (1, 6). She does not continue walking but she maintains a proximity by standing besides the foal or grazing in a circular path around the foal (6, 12, 14). When the foal is upright the mare grazes in a straight line (12, 14). During the first week after parturition dams are within 5 meters of their foals over 90% of the time (6, 14). When a foal is older the distance is extended but sometimes mares stay within 5 meters for several

months. The foal's gender has no influence on this behavior (12).

Group relations

Parturition and the suckling period are associated with short and long-term psychological and behavioral changes, related primarily to the needs of the foal. Changes in behavior significantly affect the form and frequency of social interaction between the mare and the other members of the group (7). Protection of the foal against injury from other horses is another form of maternal care (11).

Under natural herd conditions, new dams seek isolation and put more distance between themselves and other horses in the first few days after parturition to prevent others from interfering at the crucial moment of bonding between the neonate and its dam (6-8). The same situation occurs in the relationship between a human and a mare. As a rule, for the first 2-3 days after foaling a dam stays alert, not allowing the caretakers to approach within several meters, and always setting herself in the path between the intruder and a foal (15). After the first week a mare with her newborn joins the herd and the mare-foal distance progressively increases when the foal develops social bonds with other group members (10). When the foal matures, the degree to which the foal interacts with the mare declines (15, 21).

Protective behaviors are costly because they may cause a disruption of normal activities (11) and are significantly correlated with reduced reproductive success in the subsequent year (2). Maternal protectiveness does not depend on rank or experience (11), but it has been confirmed that mares in a group with more than one stallion are more protective of their foals. Stallion-foal aggression is higher when there is uncertainty of paternity and that situation occurs in multi-stallion bands (2). The intensity of maternal protectiveness, as was stated above, does not depend on a dam's rank; however, the forms of protective behaviors vary according to the position that a mare occupies in the hierarchy. Mares threaten subordinate group members and keep a distance or move away with the foal from dominants (11).

Aggressive behavior

Moderate aggression directed towards the foal is a part of normal maternal behavior. A mare's aggression occurs almost exclusively when nursing. The most common agonistic behaviors are bite threats and biting. Aggressive maternal behavior also includes: head threats with ears pinned, squealing, swishing the tail, pushing the foal with the head, kick threats, and kicking (9). In most instances foals do not respond to maternal aggression (1, 9). Such moderate aggression during suckling is associated with pain in the udder and is the result of the natural weaning of the foal (9).

Mares may be aggressive towards other horses and humans during the first day after foaling even if they are normally gentle (6, 12, 19). The aim of this behavior is to keep a foal away from other horses during the

period in which the neonate learns to recognize its dam. Moreover a mare may protect a foal from a stallion's aggression (12), which carries the risk of infanticide (2). Infanticide has been reported in horses and zebras. Also geldings can show stallion-like behavior so it is recommended not to graze geldings with mares accompanied by foals on one pasture (12). When a mare is aggressive to the threats, she circle around the foal keeping her head and chest toward the foal, while kicking (9). Dams usually do not threaten their caretakers, but may show agonistic behavior to other humans, especially veterinarians (12).

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