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The Traditional Management of the One-Humped Camel in the Horn of Africa: Milking, Fostering and Weaning Techniques

The domestication of the one-humped camel or dromedary (*Camelus dromedarius*) took place a few thousand years ago, probably in the Arabian Peninsula (Uerpmann/Uerpmann 2002) and from there it expanded to its modern-day range: Africa north of the Sahara, and other Middle Eastern and Asian countries.

All modern-day people who own camels, with the exception of the Turkana of north-west Kenya, use them as pack animals and riding animals. However, the most important use of dromedaries is for milk. As humans have to compete with camel calves for the valued milk and to fully utilize the milk production capabilities of the camel, various ethnic groups of the Horn of Africa and Middle East have developed a series of complex husbandry practices to maximize milk yield and to encourage calf weaning.

The traditional knowledge of camel milking and husbandry is vital to the success of food-security strategies of pastoral cultures in arid areas. This will be even more so in the near future, if the latest climate predictions (Thorton et al 2011) foreseeing a much drier world with a large decrease in the length of the growing season and pasture yields and an increase of rain-fed crop failures in many sub-Saharan areas are correct.

This article will discuss pastoralists' techniques and devices regarding milking, fostering and weaning camels. The insights presented here are based on direct observations obtained while carrying out the duties of Divisional Veterinary Officer for the government of Kenya in the northern part of the country between 1981 and 1989 and from then up to the present as an independent veterinarian working in development projects among camel pastoralists in Kenya (Turkana, Somali, Rendille, Borana, Gabbra, Arial Samburu), Ethiopia (Borana, Ogaden Somali, Afar), Eritrea (Tigre, Tigray-tigrinya, Rashaida), Sudan (Darfur camel livestock owners: Arabs, Zaghawa, Rizeiqat, Omdurmann camel traders), Somalia (major camel-owner clans: Hawiya, Darod, Isaaq, Issa), Western Sahara (Saharawi), Yemen and the UAE (Arabs) (Dioli 2007, Schwartz/Dioli 1992).[1] Counteless hours have been spent among camel pastoralists of these countries in discussions or just as an observer trying to understand and record their knowledge of camel husbandry.

MILKING TECHNIQUES

After the female camel has delivered, a complex husbandry is implemented by the owner to manage her lactation and the well-being of her calf. There is a wide difference among pastoral ethnic groups and sometimes even among individuals on the approach used regarding the intake of the "first milk", the colostrums, by the calf. The colostrum milk is produced by all mammals in the late phase of the pregnancy. Colostrum has a particulary high amount of protein and a lower fat level than regular milk and it contains antibodies that help to protect the newborn against disease (Elagamy 1998). Colostrum is thus milk of a special value for newborns. However, in some pastoral societies the colostrums is milked off owing to the fear of causing diarrhea, or it is used for human consumption (e.g. among the Turkana), while in some others (e.g. Somalis) the newborn calf is allowed to suckle all or part of the colostrums at will.

[1] The author is grateful to the many camel nomads in the Horn of Africa and the Arabian Peninsula who shared their wisdom and experience.

Delivery almost always occurs at the herdsman's camp. Since the newborn calf is weak and unable to walk long distances the mother and calf will not join the herd after delivery. Usually the calf is just placed under the protective shade of a shrub near the herdsman's camp and the mother left free to graze in the surroundings. New mothers are very protective towards their newborn and will never go far from it. After two to three weeks the calf is usually sufficiently developed to be able to follow its mother for considerable distances and mother and calf rejoin the main herd. At this time, to maximize milk offtake for human consumption two different management strategies are adopted, which will be discussed in the following: a separation of mother and calf, or the use of sucking-control devices, which limits the calf's drinking and guarantees milk for human consumption.

MOTHER AND CALF SEPARATION

This management strategy simply consists in separating the calf from the mother to prevent the calf suckling at will. Two milking sessions are most commonly adopted. At the beginning of the grazing day, in the morning, the mother is forced to join the main herd while the calf, together with all other calves in the herd, is kept in the night enclosure. Once the herd is far enough away, all the calves are let out and allowed to wander freely in the nearby areas. Sometimes calves are kept in their enclosure all day or tied to a nearby tree. The herd will be back at the main camp in the evening and then, after a pause to allow the herd to settle down, a milking session is implemented.

Each calf, one by one, is allowed to join its mother to suckle, then, as soon as the milk release reflex is established, the calf is again separated and the mother is rapidly milked. Unlike in cows, the milk release reflex in camels is very short, so the milk flow is available only for one to two minutes, and in the case of camels with a abundant milk production milking is often done by two people simultaneously (see picture 62). When the milking is completed the calf is allowed free access to the mother for the next few hours, only to be separated again in the middle of the night or very early morning. The next milking session is in the morning, using the same methodology, just before the herd is going to graze. The amount of milk that the calf is actually allowed to suckle when joining its mother varies greatly. It is individually controlled by the herdsman on the basis of many factors, such as the calf's age, sex and vigor, the lactation stage and the amount of milk produced by the mother, as well as by the respective season, the number of lactating camels in the herd and the household's needs. The two milking sessions within a 24-hour period can be increased to three or four, especially in the rainy season when favourable pasture conditions support more abundant milk production and allow the herd to stay longer at the main camp or to graze not far away. The camels can then be brought back to the main camp for an additional miliking session at midday.

SUCKLING CONTROL DEVICES

Under this management strategy mother and calf are together all the time. To prevent the calf suckling its mother dry and to ensure a milk supply for the household, devices are applied to the teats of the udder or to the udder itself. The devices applied to the teats consist simply of a string of cloth or of tree bark (*Acacia* spp.) tied firmly around the teat so that the teat canal is occluded and milk cannot be sucked (see picture 63). Sometimes a thin, slightly curved stick is tied on the side of the teats to prevent the calf grasping the teat and exerting suction. Even sand may also be added, by wetting the teat with the last milk of the milking sessions (or even breaking up and smearing the teat with the camel's own stool) and then throwing some sand on it to make the teat even more unpalatable to the calf. The number of teats "off limit" to the calf vary from one to all, depending on the calf's age and sex (males often are penalized), strength, lactation stage and the amount of milk produced. Obviously, the season, the number of lactating camels in the herd and the household food requirement also influence the amount of milk the calf is allowed to suckle. For each camel the number of teats tied varies during the course of the

lactation. Generally, at the beginning of lactation, to strengthen the calf and support a rapid growth, only one teat is tied and the rest are left free for the calf to suckle (Schwarts/Dioli 1992, Dioli 2007) .

Devices applied to the udder consist of an "udder net": a piece of cloth or a woven net entirely covering the udder (see picture 64) and obviously preventing the calf's access to the udder. When the camel needs to be milked, both of these devices, udder net and teat bindings, can be easily removed and the calf is allowed to suckle until the milk release reflex is established. Then the calf is removed and the camel is rapidly milked. After the camel has been milked for human needs, the calf is allowed to suckle for a variable amount of time and then the devices are applied again. In addition to the suckling control devices attached to the mother camel, occasionally a "net" is also put over the calf's mouth to prevent it suckling.

FOSTERING TECHNIQUES

Camels are very protective mothers and as a rule a lactating camel will refuse to feed any calf other than her own. Full-term vital twins have extremely rarely been recorded (Tinson et al 2001), so when a camel is seen suckling two calves the most obvious explanation is that she is suckling her own calf and an adopted one (see picture 65). Calf rejection is a serious issue as a lactating camel almost always needs the presence of her calf to have a long and abundant lactation period. If the calf dies or is rejected and the the herdsman fails to persuade the mother to adopt a foster calf, the lactation period is usually very short, only three to five months instead of the average lactation period of fourteen to sixteen months. In addition to a reduction to less than a third of the milking period, the daily milk production is also reduced when the camel has no calf. It is therefore essential that the lactating camel readily adopts another calf if her own dies, and/or to avoid a newly lactating camel rejecting her own calf. To this end, a series of techniques and devices have been developed by the different camel breeders' ethnic groups of the Horn of Africa and the Middle East. These techniques can be categorized in immobilizing, stimulating, tricking (olfactory deception) and distracting mother camels, and will be discussed in more detail.

Physical Restraints on the Mother Camel

A variety of methods is used aiming at restraining the movements of the rear legs of the mother in such a way that the foster calf or the rejected calf is able to access the udder and to suckle. It can consist of simply of a rope tying the rear legs close together or of a short hobble applied to the rear fetlocks or of a front leg, bent up and tied there or to the other front leg (see picture 66).

Stimulation of the Motherhood Instinct

The objective of this technique is the stimulation and strengthening of the motherhood instinct so that the she-camel finally accepts the calf. This is achieved by placing the lactating camel and the calf in a small, loosely built enclosure isolated from the main herd enclosure. At sunset or early night, a human disguised by a blanket or an animal skin begins to mimic the behaviour and sounds of a predator, creeping close to the enclosure and emitting high-pitched sounds. The impersonator regulates his acting carefully so that as soon the camel reacts positively, namely allowing the calf close to her side, the "predator" retreats rapidly. This technique is used among Somali and neighbouring ethnic groups for very young rejected calves and is based on the fact that camels are naturally gregarious animals that huddle together when threatened. Generally a few nights with this deceit are sufficient to establish a strong natural bond between the young calf and the lactating camel.

OLFACTORY DECEPTION

Camels recognise their calves through smell. This olfactory bond between mother and calf is so powerful that in the a calf's death the milk release reflex can be stimulated simply by presenting the skin of the dead calf to the mother. The common strategy of using the skin of a dead calf to cover a different calf so that the mother is convinced to adopt this calf, as it is often practiced with cattle (see picture 67) and other livestock species, is rarely used by camel pastoralists.

In case of a stillbirth, i.e. the delivery of a dead calf, a different technique with a similar outcome is usually used. This can only be implemented successfully *before* the dead calf is actually delivered. On verifying that the unborn calf is dead, the delivering camel is restrained with both front forelegs tied and with her head completely and securely covered with a large cloth, e.g. a blanket. The dead calf is then delivered and while the carcass is removed from the area a young camel calf selected to be fostered is brought closer to the rear of the restrained and blindfolded mother camel (see picture 68). The foster calf is immobilized by tying the front and rear legs of one side together, then fetal membranes of the dead calf are vigorously smeared all over the calf's coat. Once this is done the foster calf is placed in front of the tight she-camel and her blindfold is removed. The camel, who has just gone through the delivery process, will naturally proceed to smell the foster camel calf in front of her and, detecting the unique smell of her own afterbirth and amniotic fluids, she will think it is the one she has just delivered. The two animals will go through the biological steps of post-partum mother-calf bonding ensuring a normal lactation. For the complete success of this method it is crucial to ensure a perfectly smooth and rapid coordination between blindfolding the mother removing her still-born calf and smearing the foster calf with the afterbirth fluid. This method was described to the author by Somali herdsman but it has also been seen directly thousands of kilometers away in Western Sahara.

PHYSICAL DISCOMFORT

Another method of convincing a mother camel to accept a (foster) calf is based on a series of devices that are applied to the camel to cause physical discomfort. The aim is to distract the mother camel from rejecting the calf by creating an increasing "discomfort" until a level is reached where the camel's attention shifts from rejecting the calf's suckling attempts to how to escape the uncomfortable situation. As soon as the camel allows the rejected calf or the foster calf to suckle normally, the devices are removed. The objective is normally achieved within a few hours and the result is permanent. It has to be mentioned that some of these "techniques" can be easily identified as cruelty to animals, and as such they are ethically to be condemned. However, animal welfare comes second in harsh desert environments where the availability of camel milk can be crucial to the survival of children. These techniques can be broadly classified according to the level of discomfort caused:

DEVICE CAUSING MILD DISCOMFORT

This is a simple device that impedes walking and a normal weight bearing: one front leg is tied to the other or the fetlock of one front leg is flexed and kept in that position by a tight hobble.

DEVICE CAUSING MEDIUM DISCOMFORT

This device consists of a rope passing through the perforated nasal septum and firmly tying the other end to a very high tree branch in such a way that the head and neck of the camel are kept in an unnaturally higher and extended position (see picture 69).

Device causing severe discomfort

This is a set of practices aimed at causing increasingly severe discomfort to the she-camel by the mechanical closure of the anus and of the nostrils. They are used widely all over the Horn of Africa and the Middle East. The *qalla'h* technique used among ethnic Somali pastoralists consists of two flat pieces of wood that are applied to the loose skin folds of the anus and then tied together trapping the folds between them and impeding defecation (see picture 70) and of flat stripes of bark that are applied around the animal's nostrils to impede breathing throught the nose (see picture 71). In the Arabian Peninsula a comparable system is used, called *diar*. The anus is closed by the insertion of a large cloth "cork" into the rectum and kept in place by stitching the device to the perianal skin, tying the lose strands to a transverse piece of wood and then tying all together (see pictures 72 and 73). The nostrils are blocked by inserting cloth deep into the nasal sinus and wrapping of several "sock like" cloths over the area (see pictures 74 and 75).

In both these methods the feeling of suffocation caused by the closed nostrils (since air intake is reduced to mouth-breathing) and the abdominal pain caused by the progressive accumulation of feces in the intestine cause profound distress to the animal to such an extent that the rejection behaviour toward her own calf or toward the foster calf is completely inhibited. Furthermore, the device causes pressure on the vaginal walls causing the production of oxytocin and triggering a milk release reflex, the Ferguson reflex (Balasse 2003). The efficacy of this technique in stimulating milk release may explain why "anus closure" is also routinely used to stimulate the milk reflex in lactating camels which have lost their calf (and which are without a foster calf; see picture 76).

The devices are left in place untill the camel allows the calf to suckle. The devices may be applied from early morning, left on through out the day and removed in the early evening for a maximum of two to three days. During this period the she-camel was not allowed to graze with the main herd but kept in proximity of the camp together with the foster calf and constantly supervised by the herdsman. The herdsman often physically encourages the foster calf to suckle and in each of these occasions the behaviour of the she-camel is closely monitored to assess the degree of rejection and the strength of her milk release reflex. As soon as the camels allow the calf to suckle and the milk release is sufficient, the devices are removed.

WEANING TECHNIQUES

A camel calf is usually weaned at around 12 months of age and subsequently used only to stimululate milk release at milking time, since under natural circumstances the length of lactation is around 14 to 16 months. However, it is not unusual for a calf to try to suckle well after it has been weaned. This behavior is harmful in the view of the pastoralists because it will reduce the amount of milk available to the household and, by causing the lactation to continue, it will not allow the lactating camel to have the necessary resting period between two lactation periods The vice of prolonged suckling periods is actively discouraged by the herdsman with a series of devices:

Preventing the suckling of the teats

All teats of the udder have a long stick tied to their sides. Once the calf attempts to suckle the stick will irritate its palate and prevent it from continuing.

Causing rejection by the mother camel

This is done simply by placing one or more sharp wooden sticks over the muzzle of the calf. When it tries to suckle, the device will sting its mother's udder, forcing her to react and to actively reject any suckling attempts by her calf (see pictures 77 and 78).

PREVENTING THE CALF'S TONGUE FROM MAKING SUCTION CONTRACTIONS

One method involves tying a piece of wood across the mouth over the tongue. The wood is kept in place by tying the protruding sides to each other with a rope passing under the mandible (see pictures 79). Another method consists in making a cut several cm long across the tongue just a few mm under the upper surface (see picture 80). Both these techniques work by making the tongue of the calf unable to contract and consequently to create the suction needed for suckling. It is important to note that grazing will not be affected.

PREVENTING THE CALF FROM GRASPING THE TEATS

Another method is tightly fixing of both upper lips of the calf with a thin rope. The compression and lack of circulation will make the lips insensitive and unable to move in a coordinated way, so the calf cannot grasp the teat to suckle (see picture 81). Another method consists in limiting the movements of the lips by stitching them together with a single thick thread (see picture 82).

DISCOURAGING THE CALF FROM NUZZLING THE UDDER TO STIMULATE MILK RELEASE

A painful wound is created on the calf's muzzle. Whenever it tries to nuzzle its mother's udder there will be contact with this wound, and the pain will cause it to stop. A simple method is to burn the lips of the calf. However, the most common method is to cut a thin strip of skin on the calf's muzzle. To make the system more effective, sometimes the skin fold is wrapped with bark to keep it erect and more sensitive to contact (see pictures 83). An alternative system consists in cutting two thin strips of skin from the upper side of the nostrils and leaving them hanging (see the healed wound of this technique in picture 84).

These practices may without doubt be classified as outright animal cruelty. As such they are ethically to be condemned. However animal welfare takes second place in the harsh desert environment where a milking camel may represent the difference between a live human child and a dead one.

CONCLUSIONS

Some of the husbandry practices shown here may be questionable or open to criticism, however they represent the distillates of hundreds of years of camel husbandry that has succesfully allowed people to survive and to flourish among one of the most hostile and harsh environments in the earth. In an environment where camel milk is an essential food such practices are meaningful. As such, this traditional knowledge should be respected and not simply dismissed as backward. However, many of these practices and methods obviously cannot be adopted in a modern set up where human survival priorities are less extreme. Further studies should thefore be warranted to identify and develop more humane milking, fostering and weaning methods that can be adopted in a modern camel husbandry industry.

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