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Fakulteten för veterinärmedicin och husdjursvetenskap

Swedish University of Agricultural Sciences
Faculty of Veterinary Medicine and Animal Science

Cattle behaviour

Appearance of behaviour in wild and confinement

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Abstract

The wild ancestor of cattle, the aurox, became exterminated approximately 400 years ago in 1627 and populations of feral cattle are not numerous. Therefore, they are mostly under management and surveillance of humans (Clutton-Brock, 1999). Thus, the knowledge of wild cattle behaviour is limited and the research in cattle behaviour is mostly carried out with semi-wild herds or animals in captivity. As understanding of cattle behaviour has a strong correlation with production, well-being and general management of cattle, this paper focuses on some important aspects of cattle behaviour both on pasture and in confinement. Furthermore, the knowledge of animal behaviour can help to reduce the frequency and intensity of abnormal and undesirable behaviours caused by management.

Introduction

Animal behaviour refers to how animals react to other animals of the same species, other beings and the environment. It also concerns the overall reactions to adapt or to adjust to various internal and external conditions.

The study of animal behaviour becomes more complicated when the subject is farm animals, since such research is necessary for animal production enterprises to carry out effectively and economically while considering ethical aspects.

In the study of farm animal behaviour, feeding behaviour is an example of an important topic due to its direct effect on growth, production and income. Moreover, the reproductive behaviour of farm animals is of great importance for people managing a farm unit since it has a key role in production and replacement of culled animals.

The knowledge of animal social behaviour can help us to improve animal management, leading to reduced problems caused by fighting, injuries, fear, poor food conversion or mortality.

Literature

1. Hormone

There are two kinds of hormonal glands in the body, endocrine and exocrine. The endocrine system releases hormones into the bloodstream but the exocrine system releases liquids to the surface of the body. Sweating is an example of exocrine release.

The endocrine system has the role of controlling physiological behaviours by combining neural and glandular mechanisms. This process is happening by releasing of hormones. (Griffin, 2000)

Hormones are chemicals released by a gland at critical times and transfers messages from one part of the body to the target cells. Normally, types of cells which release specific hormones are gathered into a gland such as thyroid, testes or pituitary. Hormones can be released from one area in the body and be distributed by the bloodstream and cause physiological changes in other parts of the body. (Griffin, 2000)

Generally, hormonal functions are classified in 3 main parts. Those include manipulation of growth, effect on productions and effect on reproduction. (Squires, 2003)

Growth is the increase in body size and weight which is happening by increase in size and weight of cells. Growth is also due to increase in deposition of protein, as well as lipid. Hormones affect the extent of the deposition of muscle and fat which affect the lean yield of carcass. Hormone also can affect feed intake, feed conversion efficiency, growth performance, meat quality, tenderness, juiciness, flavour and water holding capacity.

The effects of endocrine on milk production are vital in the development and growth of the mammary gland, the initiation of the lactation and the maintenance of lactation. Moreover, metabolic diseases related to milking and lactation is affected by endocrine factors. Ketosis and milk fever are two examples. (Squires, 2003)

Hormone and stress

A stressor is any change in environment that disturbs homeostasis. Natural stress results in reactions that either has positive or negative effect to the animals. Distress disrupts animal well-being or production and may cause severe damages to the animal. A physiological reaction to stress includes changes in heart rate, blood pressure, gonadal function and immune

function. Chronic stress leads to decrease growth, increase disease, reduce fertility, gastric ulcers and hypertension.

1.1. Role of hormone in appearing of behaviour

Hormones influence sensory awareness (odour, visual). Hypothalamus neurons are in charge of internal body conduction such as hunger or thirst. In females, Oxytocin secreted from posterior pituitary, cause milk let down in mammary glands or tightening in the uterus during child birth. Hormones are also associated with emotional effect in parental behaviour and maternal competence. Sex steroids initiate the basic female and male anatomy but also allow animals to later respond to their activating effect. Expression of sex differences in behaviour also requires the steroids since they activate many aspects of the phenotype during maturation. The location of various endocrine glands in cattle is illustrated in figure 1 and the synthesis of hormones by these glands can be found in table 1.

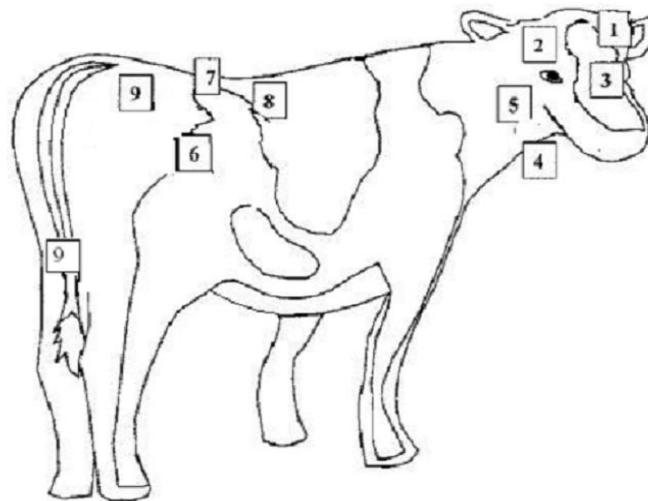


Fig.1.The location of endocrine glands in cattle. 1. Pineal 2. Hypothalamus 3. Pituitary 4. Thyroid 5. Parathyroid 6. Pancreas 7. Adrenal 8. Kidney 9. Ovary/testis
(After Squires, 2003)

Hypothalamus and pituitary

Hypothalamus is a part of the brain and it is located above the pituitary (hypophysis). The pituitary gland includes two lobes, posterior pituitary and anterior pituitary. Posterior pituitary is nervous tissue that develops as an outgrowth of the diencephalon. It receives hormones that

are made in the hypothalamus and are transported along the axons to the posterior pituitary. Anterior pituitary is glandular tissue and it produces a number of Trophic releasing hormones that stimulate hormone releasing by target tissue. Hypothalamus is connected with many neurones from other parts of the body and receives signals from other environmental cues. It produces releasing hormones and releases inhibiting hormones. (Merriam, 1982)

Oxytocin and Vasopressin are two hormones that are released from the posterior pituitary. Oxytocin causes smooth muscle that includes cells for milk let down in mammary gland and also during parturition. Vasopressin is an antidiuretic hormone that stimulates reabsorption of water from the kidneys when blood volume or pressure is decreased. (Merriam, 1982)

Anterior pituitary produces a number of Trophic hormones that cause hormone release from target tissue, Growth hormone, Prolactin, TSH and FSH are some examples.(Merriam, 1982) Hormones released by hypothalamus, the target issue and their ultimate effects are summarized in the table 2.

Table1. Summary of the hormones produced by endocrine glands and their functions (Griffin, 2000)

Endocrine gland	Hormones	Physiological reactions
Hypothalamus	TRH GnRH CRH GHRH and GH-RIH PRF and PIF MRF and MIF	TSH and PRL anterior pituitary LH and FSH ACTH, stress Growth hormone prolactin Melanocyte
Pituitary(anterior)	Growth hormone Prolactin TSH FSH LH ACTH MSH Oxytocin Vasopressin	Somatomedin by liver Mammary glands Thyroid hormone Follicular growth, Ovulation Adrenal steroid Melanogenesis Milk ejection Antidiuretic hormone
Pituitary(posterior)		
Pineal	Melatonin	Seasonality, gonad function
Parathyroid	Parathyroid hormone	Cal and P Metabolism
Thyroid	Thyroxin (T₄) and triiodothyronine (T₃)	Metabolic rate
Adrenal cortex	Cortisol, Corticosterone, Aldosterone (Nor)Epinephrine	Carbohydrate metabolism, Sodium reaction Alarm reactions
Adrenal medulla		
Pancreas	Insulin, glucagon	Blood glucose
Gastrointestinal tract	Gastrin, GIP, secretin cholecystokinin	HCl and bicarbonate Pancreatic enzymes
Kidney	Erythropoietin	Blood cell formation

Table2. Hypothalamic hormones (Griffin, 2000)

Releasing hormone	Target issue and hormone	Effect
Thyrotrophin releasing hormone	Thyrotrophic hormone, Prolactin	Regulate metabolic rate Synthesis of milk
Gonadotrophin releasing hormone	Luteinizing hormone, Follicle stimulating hormone	Affects ovulation Affects gonadal
Corticotrophin releasing hormone	Adrenocortical steroids from adrenal cortex	Response to stress
Growth hormone releasing hormone, Growth hormone release-inhibiting hormone	Somatomedin production by liver	Increase growth
Melanocyte stimulating hormone releasing and inhibiting hormones	Melanocytes	Increase skin pigments
Prolactin releasing and inhibiting hormones	Mammary gland	Synthesis of milk

2. Behaviour

The behaviours of cattle are dependent on genetic and environmental factors. The wild ancestor survived in Poland until 1627 when the last cow was shot or captured by humans (Clutton-Brock, 1999). Therefore, the wild population of cattle are reared and mostly cattle population are under surveillance of humans to some extent and this management and confined life can affect the overall behaviour of cattle.

The inner aspects which can affect the appearance of behaviour are gender, differences between breeds and also the effect of some farming treatments and various medical procedures, for instance castration, dehorning and tail docking.

2.1. Inner aspects

2.1.1. Gender

Not many studies have been conducted on the behaviour of cattle in groups with natural sex ratio. However, a study by Hall (1986) showed significant differences in how bulls and cows organized their time. During day time bulls spent less time grazing in comparison with cows. However, during the night the bulls' grazing periods were longer. Cows can ruminate standing up or laying down while bulls tend to stand up during the rumination periods. This behaviour can be due to the fact that bulls are more prepared for social encounters (Hall, 1986).

2.1.2. Breed differences

The behavioural differences between breeds exist because farmers select each breed for specific purposes. For instance, it is often easier for dairy breeds to cope with early weaning in comparison with beef breeds that are selected for good parental care (Le Neindre, 1993). Also, behavioural differences within a breed often have a genetic reason. For example, in dairy cattle, temperament during milking is very crucial (Phillips, 1993).

2.1.3. Effects of farming treatments and medical procedures

The farming treatments such as dehorning, docking, castration and etc. are applying to increase production level in a way to eliminate or reduce aggression and probability of injuries besides improving the production quality. However, these treatments are banned in many countries due to the welfare issues.

2.1.3.1. Castration

Castration refers to the treatment of sterilising the bull, i.e. removing the testicle or destruction of the testicles function. The treatment is used in order to prevent unwanted mating, reduce aggression in the herd and increase meat quality. Although it is banned in many parts of the world, it is still used as a method to economically improve the meat production industry.

2.1.3.2. Disbudding and Dehorning

The horns have various biological roles, for example, a way of strengthen courtship display, thermoregulation, defending tool against predators and as an intraspecific fighting tool.

Disbudding refers to destroying the horn producing cells of horn bud. Several methods for disbudding cattle are available. The most common method is hot-iron which considered as painful treatment and excessive heat can damage the bone beneath.

Dehorning is removing the horn after they are formed. Physical method of dehorning is applied by use of embryotomy wire, guillotine shears, dehorning knives, saws etc. (Vickers, 2005)

Dehorning and disbudding have some advantages. Carcass wastage is less in dehorned cattle and trim related to bruising from horned cattle are twice that for carcasses from hornless cattle, less feeding trough space required for dehorned cattle, easier and less dangerous to handle and transport, lower risks of interference of dominant animal at feeding time, reduced risk of injury for handler. (Stafford, 2005)

2.1.3.3. Welfare concerns of dehorning and disbudding

Behavioural and physiological indicators have been used to assess acute distress response to potentially painful husbandry procedures. Indicators could be avoidance behaviour during dehorning including tail wagging, head movement. Also, post operating factors of pain includes head rubbing, head shaking, neck extension, tail flicking, increased number of shifting from standing and lying position and reduced rumination. Risks of sinusitis bleeding, prolonged wound healing and infection are other disadvantages of dehorning and disbudding. Therefore, selection of the polled cattle can be an alternative to eliminate the need of dehorning. (Stilwell, 2008)

According to the Swedish Animal Welfare Ordinance (1988: 539), dehorning and disbudding of cattle should be done under anesthesia and performed by a veterinarian or a person who is approved by a veterinarian.

2.2. Basic behaviour

2.2.1. Feeding

Feeding refers to the behavioural aspects of the nutrition process. There is a difference between feeding behaviour in the wild and in captivity. In the wild, feeding behaviour is accompanied by food-seeking behaviour. Also, food selection of animals feeding in the wild

is more developed compared to those kept in barns. Cattle need to maintain their energy through food intake which includes carbohydrates, fats and protein. There are both external and internal factors motivating feeding behaviour. Smell of food, seeing other animals eating and sounds of other animals eating are examples of external factors. (Mephram, 1995)

Cattle are ruminant herbivores and in the wild they spend approximately 8-9 hours grazing on a daily basis (Phillips, 1985). They are diurnal feeders but mostly crepuscular. Crepuscular animals are mostly active during sunrise and sunset (Albright, 1997).

Feeding behaviour can be affected by many aspects such as climate, teeth condition, competition and food quality. Generally, feed consumption has a reverse relation with temperature and during normal circumstances, an increase in temperature causes lower feed consumption (Kilgour, 1984).

Cattle prefer more leaf material and at the time of grazing they consume the upper layer of the grass. When grazing, cattle gather a pile of grass into the mouth with the help of the tongue and then they press the grass between the lower front teeth and the upper palate. The grass is then cut off by moving the neck. They can graze up to 70 bites per minute (Phillips, 1993). Cattle are unable to graze the grass shorter than 1cm to the ground, and they are relatively unselective. By reducing the height of the grasses, they keep up the rate of grazing and accept a lower quality of grass (Domont, 1995).

The feeding behaviours which cattle show in barn conditions are similar to grazing behaviour of cattle unless, usually due to the crowded condition, they should compete with other members of the herd to reach the food. Also, they lie and rest more since they spend less time to find food (Phillips, 1993).

Feeding is directly connected to almost all different aspects of cattle production. Feeding is the large part of the cost of raising cattle, since it directly affects the production quality and quantity. A sufficient diet will prevent health problems and stress so feeding can affect the welfare of cattle, as well.

2.2.2. Drinking

Water counts as an indispensable factor for the survival and well-being of animals. Ruminant's bodies contain large amounts of water; the body of a cow contains 50-60% water (Maynard, 1952). The need for water is even more essential for dairy cows since milk

contains about 87% water. The metabolism of high yielding cows results in large amount of waste. Water is needed in order to make urine excreting some of the waste products.

Natural drinking behaviour according to the grazing cows is to dip their muzzles 3-4 cm into the water with the angle of approximately 60 degree. The nostrils are always over the water and the cow swallows the water without raising the head (Hafez, 1969).

The factors affecting water consumption are dry matter intake (Holster, 1992), milk yield (Meyer, 2004), temperature, rainfall, humidity, sunlight (Murphy, 1983) and water temperature (Andersson, 1084). Also, there are some other factors influencing water intakes to a lesser extent such as sodium intake (Meyer, 2004).

Cattle usually drink during day time and often occur in relation to feeding and milking events in dairy cattle. Water intake rhythm is quite same as feed consumption and it happens meanwhile feeding or shortly after feeding (Cardot, 2007).

2.2.3. Rumination

Rumination is considered as a natural behaviour for ruminants and the process involves breaking down the feed in order to make it pass through the digestion channel. Also rumination helps the rumen bacteria to have better access to feed through the fermentation process. (Russell, 2001)

Some studies show that the rumination pattern and changes in rumination may be used to evaluate the responses of animals to acute stressors (Schirmann, 2011). Moreover, changes in rumination can be a sign of disease (Devries, 2009).

Cattle normally spend 6-7 hours a day ruminating and each period takes about 45 minutes. When cattle ruminate, they become drowsy and their alertness is reduced. Also, they can either lie down or ruminate while doing another activities such as standing, walking, scratching, urinating, defecating and nursing (Fraser, 1997; Beauchemin,1991). Rumination can be influenced by nutritional reasons, for example, quality of forage, digestibility of the feed and NDF intake (Beauchemin, 1991).

2.2.4. Rest and Sleep

In the wild, the mother usually keeps the new-born calf far away from other herd members during the first 3-4 days in order to strengthen the mother young bond. During this period the calf is resting about 75% of the day (Lidfors 1994). After joining the group, calves tend to rest at the specific resting area and close to certain other calves (Bouissou, 2001). Calves resting

time in confinement and wild situations differ. They tend to rest for up to 80 % of the day during the first 6 months of age and this amount reduces to 50% in wild conditions (Le-Neindre 1993). Cattles spend 1-2% of the day resting on their side. However the reason of various resting positions is not clear (Le-Neindre, 1993).

Cattle sleeping stages can be described considering resting body position and eye movement (De Wilt, 1985). Adult cattle sleep approximately 4 hours a day but can be drowsy for up to 8 more hours (Ruckebush, 1972). Naturally, cattle sleep when lying down. However, NREM (NON Rapid Eye Movement) sleep while standing is feasible when it is impossible for the cattle to lie down and rest. Rumination is also possible during NREM but not during REM (Rapid Eye Movement) in cattle. (Hannien, 2008)

The standing and lying behaviour patterns in dairy cows especially after milking may reduce the risk of intramammary infection (IMI). A study in France (Barnouin, 2004) indicates that cows that were locked to the feeding area without possibility of lying after milking were having very low Somatic Cell Counts. In another study, Peeler (2000) showed that the incident of Mastitis was lower in the herd that were given fresh feed after milking both in the morning and afternoon.

2.2.5. Locomotion

Locomotion is not the only movement. Changes in the position of body parts ,for instance the head and neck, are included in cattle locomotion. Naturally cattle move forwards, however moving lateral or backwards are happening at the time of fear and/or physical restriction (Gardin, 1997).

According to some studies, cows spend more time walking at pasture than found in free-stall barns (Schofield, 1991). These behavioural differences can be increased if the cows face more difficulties when moving around in the barn. The difficulties may include deep slurry, roughness of the surface, slippery floors and inappropriate barn partitioning.

Cattle locomotion divides in 3 different kinds: walk, trot and gallop. Walk is the most common way of moving for cattle and is usually practiced when the animals are searching for food or water. Observation of walking movements and the legs positions during walking can indicate various kinds of problems or disease associated with legs and hooves. Limping is one of the most usual problems and it causes a lot of discomfort and changes in behaviours of cattle (Arnold, 1978). Trot is a fast walk that can reach the level of 5km/h and mostly happens at the time of fear, anxiety and excitement.

Gallop is a movement mostly using the rear legs. Cattle mostly gallop when there is fear, force or joy involved. Basically the front legs move together and the hind leg together. Cattle lift up their tail over the rump when galloping. (Albright, 1997)

2.3. Social behaviour

Cattle are considered as gregarious animal, i.e. lives in a herd. Accordingly, they live in herds with other conspecifics and their behaviours are strongly dependent on other members of the herd. It is believed that a cow can recognize 50-70 other conspecifics (Fraser, 1997). The importance of social behaviour in cattle or in other herd living animals becomes evident when the animal keepers aim to manage their herds. For example, when they plan to perform some medical treatment or transport them to another place, they should know the way animals communicate with each other and how to control them in order to reduce the probable risks of handling and improving their welfare.

Wild herds are usually based according to a gynocratic model consisting of mothers and young together. Adult males are only joining the herd during the reproductive period. This forming of the herd has been observed in groups of cattle that have been returned to the wild conditions (Keeling, 2001).

Now-a-days, wild herds of cattle are rare and the behaviours shown by animals are mostly influenced by farming conditions. Since the males and females are separated in industrial farming, they rarely show territorial defence. The territorial defence in farm conditions are often caused by competition for space, food or water instead of defence against predators under wild conditions.

The concept of “Cattle Social Behaviour” was discussed significantly for the first time by Woodbury in early 40s. There are several aspects describing the social relationship between conspecifics in a herd, for example likeness between animals, individual space as well as hierarchy in the herd (dominancy and subordination).

2.3.1. Likeness

Likeness or affinity among herd animals refers to the favourable relationship in a group. This quality can be observed in a group where members have close contact, spatial closeness and low aggressive interactions. Likeness and affinity are considered as an early age quality which can develop during the first six months of age. Thus, it is stronger in animals that reared together from early days of birth. Affinity in a herd can lead to reduction in competitive behaviour among animals and also develop the formation of the herd (Bouissou, 2001).

2.3.2. Individual space

Individual space or flight zone refers to the space around animals which avoid interfering with other conspecific or humans. In case an animal or a human enters the flight zone of cattle, the animal would move away or show aggressive behaviour according to its social rank. The individual space differs from animal to animal and it is correlated with tameness. The size of an animal's individual space or flight zone can vary from zero to a wide area (Phillips, 1993). Individual space is a very important term in animal husbandry and especially during roundup (capture). Animal keepers can easily stimulate animals to move simply by entering their flight zone from the appropriate side and reduce the time spent chasing the animal. More important this can also decrease possible aggression, injury or damage (Grandin, 1995).

2.3.3. Hierarchy

The hierarchy of a herd can be very simple like a straight line as it is illustrated below. Cows are dominant or show subordination to each other according to the various factors such as priority of joining the herd, age and milking level. In this case, the cow that entered the barn first is dominant to the one who entered next and this system follows by the all the group. On the other hand, a complicated hierarchy system may settle in a group in a way that a cow shows subordination to another cow but being dominant to an individual that is of higher rank than the first one. In the mentioned system, there are other stronger factors such as body size that influencing the hierarchy system more than the factors in the first system

Cow 1 → Cow 2 → Cow 3 → Cow 4 → Cow 5 → Cow 6
(Fig.1)

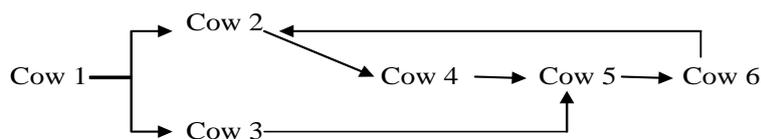


Fig.1.T

two hierarchy samples

Hierarchy in a herd normally forms at the early hours when animal are exposed to a selecting group. The natural flight zone is usually respected in a herd at the time of access to their basic need. However in case of limitation in resources or lack of space this respect might be interrupted be replaced by aggression. (Berstain, 1981)

Moreover, about 25% of dominancy-subordination relations in a herd may change each year in a way that a cow which uses to be subordinate to another cow, may become dominant to her (Philips, 1993).

2.3.4. Dominance

Dominance is referring to the ability of an individual to suppress the behaviour of one individual or group of animals in a herd (Albright, 1997). Dominance has a large range of intensity and has a root in one or combination of early age experiences, body size, inheritance, age, sex and animal temper. (Albright, 1997)

The elements that may influence dominance behaviour vary a lot and it is hard to take a broad view of them. It usually gained from youngest ages but studies show it is not the same in all the cases. Also the hormonal and genetical effect on dominance is hard to evaluate. The factor of age can be altered by regrouping the herd, so it is not always the oldest one that dominates others. Also, the size, weight and colour are not a strong factor. Other factors such as; mother's social rank, sex, temperament and breed can be effective according to some studies (Le Neindre & Sourd, 1984).

In the wild, dominant animals have a leading role to protect the group from invaders and also to help the group finding resources such as food and water. These qualities tempt the subordinate animal to stay in the group because the hierarchy in group may change over time and a subordinate animal can be a dominant one in the future (Lindberg, 2001). The hierarchy system in captivity varies a lot compared to the wild conditions. In captivity, low ranked cows have not the chance to leave the group and clearly it leads to the appearance of aggressive behaviours (Keeling, 2001). Also, there is no threat for the high ranked cow like those existing in the wild (such as predator), so the chances of changing the hierarchy within the group are minor. Therefore, if we add the factors such as better access to feed, water and resting place, it become more obvious that dominant cows have better welfare compare to the low ranked (Phillips, 2002). Also, the hierarchy in the group can have economical effects in farm management as high ranked cows usually produce more milk and consume more feed especially when there is limited access to the feed (Albright, 1997). Low ranked cows adjusted their eating situation more than high ranked cows did when there was high competition for the feed (Olofsson, 1999). Although, cows normally tend to be less active during the night and mostly lay down, low ranked cows spent less time resting in a crowded barn (Wierenga, 1990).

2.4. Reproductive and Sexual behaviour

In this section, the behavioural aspects of reproduction will be discussed. However, the physiological aspects won't be described.

The reproduction process in cattle can be separated in 3 steps as follow: courtship, chasing and approach. (Phillips, 1993)

In wild, bulls recognize the female in heat through sniffing the urine known as 'Flehmen' behaviour. By guarding, the bull proves his intension to the other males and decreases the competitors. Usually bull tries several times to see the female is physiologically and behaviourally fully receptive. This process includes behaviours like sniffing genital area, putting head on her pelvis and tries to cover her. (Geary, 1991)

The reproductive behaviour in farm and captive conditions vary a lot and the courtship behaviour are rarely observed. The reproduction process in captivity mostly depended on the farm's plan.

2.4.1. Oestrus

When cows are getting close to ovulation, they become impatient and overactive in order to attract bulls. Also, cow-cow mounting is observed a lot in this period. The mounting behaviour usually continues to the level that a bull starts to guard the cows from other members of the herd. This guarding action of bulls is accompanied with chasing off other bulls in order not to let them get close to the cow. The bull also prevents the cow to re-join the herd and this process continue to the point that the cow stands still and the bull stands behind the cow with his head by her hump. Usually, 24hours after the start of oestrus, she become receptive and the bull may serve her about five times. (Albright, 1997)

In a herd of cows in which no bull exists and reproduction is based on artificial insemination, cow-cow mounting occurs a lot. Around 90% of the mounted cows are in oestrus but only 70% of the mounting cows are in oestrus (Phillips, 1993).

In cattle as like in most ruminants, maturation take place in early ages and in this period the animals grow fast. At birth the sensory organs of the calves are developed and the locomotion and thermoregulation of the calves are improved within early hours of life. The role of the mother is mainly to help the calves what to eat and also in terms of social bond with other calves. In other words, mother shows the calves how to interact with other barn members(Phillips, 1993).

2.4.2. Calving

Calving is a crucial period in the reproductive process of cattle. In the wild, cow calves alone, away from the other members of the herd. Giving birth takes normally around 2-3 hours depending on the mother's experience and environment (Lidfors, 1994).

When the calf has been delivered, the placenta is coming and often eaten by the mother. The reason could be to hide all the signs and traces of birth from predators. Birth can happen both during the day and night (Albright, 1997).

The mother sniffs the calf after birth in order to keep the scent in her olfactory memory, helping her to recognize the calf. Cows recognise their calves easily, unless a lot of calves are at the same place. Grooming also is a part of this olfactory recognition (Lidfors, 1994).

Visual identification by colour and patterns of the coat is a way of recognition from distance and also at the time of high concentration of cows. Vocalization is the other way of recognition which has a lower importance in a herd (Lidfors, 1994).

2.4.3. Maternal

Although cows are counted as social (gregarious) animals, the maternal behaviour starts when cows choose the nesting spot and leaves the rest of the group (Lidfors 1994). The nest building behaviour is done by one third of the cows (Wehrend, 2006). The area with dry surface, surrounded by trees and branches on top is a favourable area for nest building by cows (Lidfors, 1994). Also according to some studies, outdoor calving mostly happens during the night (Edward, 1983).

Maternal behaviour can be divided in two parts; a care giving behaviour and a care seeking behaviour phase. The care giving behaviour appears soon after parturition. Directly after giving birth, the cow's sense of smell helps her to recognize her calf (Taylor 1998). More significantly, care giving behaviour appears at the time when the cow starts to lick her calf right after delivery in order to help the thermoregulation system of the calf by drying the coat. The first 5 minutes of grooming helps to motivate the urinal system. The grooming may last up to 30 minutes. Also, the grooming tightens the bond between the mother and the young. The weaker bond that has been observed between the twins and mothers is thought to be caused by the less time spent grooming each calf. The first few hours after calving are usually less stressful for the mother and her young and in absence of interruptions, the mother and young bond usually continues for about 120 days after birth. In this period of time, milk production decreases and that force the calf to search for another food substitute. The care

giving behaviours of cows start to decline after approximately 120 days of calf life (Taylor, 1998). After that, care seeking behaviour by calves start to be evident. Young animals naturally starts vocalize if disturbed, stressed or hungry. The presence of a cow close to the calf can reduce their stress (Taylor, 1998).

2.4.4. Young and playful behaviour

Basically, quality and quantity of playing behaviour varies a lot regarding the environmental conditions and can be used as a parameter to evaluate the environmental and health status of an animal (Martin, 1985). The study of semi wild cattle illustrates that they are mainly social and locomotive animals (Reinhardt, 1983). Locomotion refers to galloping, bucking and kicking which happen among calves in a group and not only between two individuals. Social behaviour is related to locomotion and explains fighting and mounting without purpose. All these aspects of play behaviour require space. Moreover, studies showed that confinement has a negative effect on locomotion in cattle (Dellmeier, 1985).

2.5. *Abnormal behaviour*

The best way to distinguish between normal and abnormal behaviour is to look if the behaviour has connection with one of the following sources of information about normal behaviour; behaviour of the ancestors, behaviours of feral animals and behaviour of domestic animals when returned to a similar environment as their ancestors (usually with the aim of research and experiments).

Like many other animals in confinement, cattle might show behaviours which are rare in the wild. Some of these behaviours are simple and unnecessary movements that are repeated over a period of time, over and over again and they basically are not functioning at all in the situations which they are being performed.

2.5.1. Stereotypies

In cattle, some of the most common stereotypic behaviours are tongue rolling (mostly outside but in some cases inside the open mouth of the animal), bar-biting and licking. Bar-biting and licking or biting the stall equipment is more common in tethered cows (Redbo, 1990).

Tongue rolling may be caused by several environmental factors, for example, frustration due to restricted offering of roughage (Redbo, 1997), artificial suckling (Sato, 1994), barren housing and tethering (Redbo, 1990).

Lack of movement and close confinement is a factor of increasing time spent on showing stereotypic behaviour. On the other side, a significant decrease observed in stereotypic behaviour showing by the cows after being released to pasture. However they showed a higher level of stereotypic behaviour after sending back to confinement and being tethered (Redbo 1992, Redbo 1993).

Discussion

Pasture provides a preferable environment for cattle close to their natural habitat in which they can express their natural behaviour without restraints. An example of the natural behaviour which is only possible on pasture condition is that pasture gives the cattle opportunity to lie in stretched positions in an unlimited comfortable lying space (Krohn, 1993).

Methods of distribution and type of feed have a major impact on cattle feeding behaviour. Cattle normally spend more time grazing on pasture than in the barn. Typically, they spend 4-6 hours per day eating in a barn while spending between 6 to 10 hours grazing on pasture. Moreover, the purpose of cattle production has a significant effect on the pattern of feeding behaviour. For instance, dairy cattle have more harmonized feeding behaviour on pasture than in barns. Also, they eat less on pasture during night time (Tucker, 2008). In addition, the feed on pasture is widely spread and the cows can eat all together at the same time, as they naturally do. However, in barn conditions, feed can be found only in troughs and space limitations makes it impossible for cattle to eat all at the same time. Therefore, it can lead to the appearance of aggressive behaviour.

Diurnal rhythm of lying behaviour is more harmonized when cattle are on pasture. They usually spend 8-12 hours lying down per day. Also they prefer to graze during the day and lying down during the night (Tucker, 2008). Cattle in barns tend to distribute feeding and lying behaviour both during day and night. However, there are some factors influencing the synchronizing of cattle behaviour in barns. Delivery of feed is one of the most important factors in synchronizing cattle diurnal behaviour.

Cattle on pasture conditions tend to stand in the shade during warm seasons. This can be due to the reason that they absorb less heat while standing because air can circulate around their body. Furthermore, in warm weather, dairy cows spend more time standing in shade and to graze more during nights in order to avoid heat (Kendall, 2006).

Mating and sexual behaviour on pasture conditions are adapted in the way that calves are born when the grass are beginning to grow. However, in indoor based dairy farms, cows calve the entire year around in order to constantly produce milk for human consumption.

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Abbreviations

ACTH	Adrenocorticotrophic hormone
CRH	Corticotrophin releasing factor
FSH	Follicle Stimulating Hormone
GH	growth hormone
GHRH	growth hormone releasing hormone
GH-RIH	growth hormone releasing-inhibiting hormone
GIP	Gastric inhibitory peptide
GnRH	Gonadotropin releasing hormone
LH	Luteinizing hormone
MIF	Melanotrophin release-inhibiting factor
MRF	Melanocyte stimulating hormone releasing factor
MSH	Melanocyte stimulating hormone
NDF	neutral detergent fiber
PIF	Prolactin inhibiting factor
PRF	Prolactin releasing factor
PTH	Parathyroid hormone
TRH	Thyrotrophin releasing hormone
TSH	Thyroid stimulating hormone

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