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REVIEW ARTICLE

Elements of Behavior in Cattle- An Overview

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Abstract

Understanding models of animal behavior in domestic animals helps us to identify animal need, comfort and health. Further it helps in scientific planning and decision making for animal improvement and its efficient utilization in sustainable manner. Nine systems of behaviors are seen aptly in animals which cover all the activities including feeding, elimination, sexual, attention giving and seeking, agonistic, exploratory, herding, shelter seeking and exploratory behavior. Proper posture, duration feeding and resting time control production performance of animals. Preventing normal care giving or maternal behavior seems to interfere with licking of calf and formation of cow-calf bond. Behavior models especially ingestive, maternal and estrus are important as it is controlled by blood metabolites, hormones and pheromones. In coming decades of climate change and global warming animal is going to suffer especially with respect to its production and comfort. Productivity is often used as an indicator of animal health. However, focusing only on productivity can in some cases lead to poor conditions of animal wellbeing. In most situations, welfare-friendly production will require which, shift the system towards sustainability.

Keywords: Animals **b**ehavior, Animal Welfare, Health and production, Stimulus, Stress.

1. Introduction

Animal behavior defined as an expression or effort to adopt or adjust to different internal or external conditions. Simply it is animal response to a stimulus. Every response to a stimulus is directed towards two major requirements i.e., keeping themselves alive or keeping species alive i.e., reproduction. All these behaviors evolved through natural selection by means of survival of fittest concept of "Spencer". For efficient and economic management of farm it is essential to have knowledge of animals' behaviors especially to the handlers who are always in direct contact of animals. Assessment of animal welfare also based on behavior observation of animals directed at two key points i.e., health of animals (Fraser and Broom, 1990; Appleby and Hughes, 1997; Dawkins, 2001) and do they have what they want (Dawkins, 2004). Productivity is often used as an indicator of animal health (Broom, 1991). However, focusing only on productivity can in some cases lead to poor conditions of animal and wellbeing. In most situations, welfare-friendly production will require more land area per animal or per unit of product (Siegford *et al.*, 2008), moreover microbial load is increasing in environment especially the *Salmonella*. Study of animal behaviors used frequently to study the health status, particularly assessment of pain (Rutherford, 2002). These behaviors are of more than just basic biological interest i.e., the understanding of maternal behavior can be used to improve the care and management of farm animals (von Keyserlingk and Weary, 2007). For example under extensive or semi-extensive condition cows will separate themselves from herd mates before parturition. Moreover, preventing this element of maternal behavior seems to interfere with licking of calf and other behaviors important in formation of cow-calf bond. **Instinct:** It is inbuilt response to a stimulus present since birth in animals e.g. nursing in mammals; **Habituation:** It is lack of response to repeated stimulus also known as conditioning. It includes classical example of association between an unconditional stimulus and a neutral stimulus (Pavlov's Dog) and operant learning to respond to a stimulus as a result of reinforcement.

2. Fields of Animal Behavior

It includes trial and error, reasoning and imprin-

Table 1: Summary of ingestive behavior of Cows

Grazing		Rumination		Drinking, lying and loafing	
Grazing time	4-9 hrs	Time of rumination	4-9 hrs	No. of drink	1-4 times a day
Total no. of bites	24,000	Number of rumination period	15-20	Total time in drinking	30 minutes
Rate of grazing (Bites/minute)	50-80	No. of boluses	360	Time spent in lying	9-12 hrs
Amount graze (Fresh herbage)	10% of body wt	No. of bites per bolus	48	Time spent in loafing	8-9 hrs
Grazing distance	2-3 miles	Rate of chew per minute	60-90	Social interaction	2-3 hrs

-ting. Trial and error is trying different response in animals until the correct one is performed. Reasoning is correct response to stimulus for first time. Intelligence is part of reasoning, which includes short and long term memories. Imprinting is bonding process especially in young one mostly for recognition process. Communication between the animal is common by visual, vocal, olfactory, body language and tactile cue.

2.1 Factors, Which Governs Welfare of Animal

These include five freedom concepts (Webster, 2001)

a. Freedom from thirst and hunger: by ready access to food and water
b. Freedom from discomfort: by ready access to comfortable shelter and resting area
c. Freedom from pain injury and disease: by prevention, rapid diagnosis and treatment of cause
d. Freedom to express normal behavior: by providing proper space, relatives and companion
e. Freedom from fear and distress: by ensuring condition and treatment which avoid suffering.

Even though commonly known "stress hormones" cortisol" measurements taken in isolation are often difficult to interpret in welfare terms because level rise not only when animal is in stress, but also when engaged in activities such as eating and mating (Toates, 1995).

3. Categorization of Systems of Behavior

These are categorized into nine types as mentioned below:

a. Ingestive behavior
b. Eliminative behavior
c. Sexual behavior
d. Care giving or Epimelitic behavior
e. Care soliciting or Et-Epimelitic behavior
f. Agonistic behavior
g. Allelomimetic behavior
h. Shelter seeking behavior
i. Investigatory/ exploratory behavior

3.1 Ingestive Behavior

Eating and drinking of any sorts of solid or liquid substance is included under ingestive behavior of animals. All farm animals spend more time in eating as compared to carnivores. Teeth of carnivores not permit the lateral grinding. For grasping feed cow uses their highly mobile tongue. They catch and encircle the grass by tongue and draw it in mouth. Lower teeth and tongue used to cut and crush by sudden and slight jerk of head. By utilizing this nature of feed ingestion, generally grass of size lower than 1 cm. is not ingested by cow. After taking 2 to 3 bites cow use to partial chew the bites and swallow. One bite includes taking cutting and limited crushing. The summary of the ingestive behavior of cow is summarized in Table 1.

Ingestive behavior in crossbred cow (Holstein/Zebu) was not influenced by season of the year (Nascimento *et al.*, 2013). Cows eating with their heads in the downward position produce 17% more saliva, which directly affects rumen function as compared to cow eating with head, held horizontally (Albright, 1993). Author also reported the superiority of ground level feeding as compared to elevated bunk as cows in ground feeding show little or no feed tossing behavior.

Grazing is most actively performed during sunrise and sun set i.e., crepuscular type. Night grazing is common in summer season in tropical condition.

During hot weather animals prefer to graze in morning and evening and prefer to rest or ruminate during sizzling part of the day. In dairy cattle eating or grazing peak was noticed just after morning milking. Selective grazing is common in cow in tropical area. Selective grazing is of two types i.e., **Progressive defoliation:** Selection of most succulent part of the plant by a cow; and **Creaming:** Selection of particular plant in field or pasture by a cow.

Dominant cow take more feed if manger space is less in the farm. More competitive situation arises when manger space reduced from 0.5 to 0.1 m. Plasma gherlin (27 AA peptides) concentration increases in response to fasting or decrease rumen fill which decreases during subsequent feeding and ingestive behavior in ruminants (Wertz-Lutz *et al.,* 2006; Roche *et al.,* 2007; Gregorini *et al.,* 2009).

Rumination is act of regurgitation, re-mastication and re-swallowing of previously ingested feeds. 65-80% of total rumination is done in lying condition in cow. Rumination behavior starts at the age of 3 weeks in calf however rumination does not reach up to the mark until age of 6-8 months. Chaffing of fodder have no effect on rumination time, however rumination time reduced in ground hay or concentrate mixture.

Rumination: grazing ratio (R: G) = ¾ : 1

3.1.1 Silent Points of Rumination

a. Rumination decreases during estrus however does not ceases completely
b. Rumination ceases during curiosity, hunger, fear, pain, maternal anxiety etc.
c. It also stops when cow listens unusual fearful sound and during second stage of parturition.

3.1.2 Suckling Behavior in Calf

This behavior starts 2-5 hrs of birth. Suckling generates negative pressure inside oral cavity around 250-400 mm of Hg.

3.1.3 Drinking Behavior

Cattle drink usually in forenoon or early after noon rarely at night or dusk. Dairy cows tend to drink after milking. Water intake rises in down calvers and lactating cows. Zebu cattle conserve more water and hence take less water as compared to European breeds.

3.1.4 Hunger Call

Cry of young or hunger call or even recorded audio stimulation is important psychosomatic stimulus for the mother, which significantly increases oxytocin release and milk production (Pollock and Hurnik, 1978).

3.2 Eliminative Behavior

This behavior is related to pattern of elimination of feces and urine. Characteristics pattern of elimination exist in particular species. Elimination affected by stress especially the shrinkage loss in cattle is common in transport. Normal cattle defecate 12-18 times daily, urinates 7-11 times daily. Standing to void followed by moving forward is the predominant pattern of behavior in cattle (Aland *et al.,* 2002). Cows were actively moving away from excreta more often when at pasture than when confined indoors (Kondo and Hurnik, 1990).

Highest frequency of defecation period was registered during intense human activity in the shed, especially during milking and feeding time. Average number of defecating period per 24 h registered during winter season was of 8.60 and of 8.50 periods during summer. During winter urination period per 24 h of 8.40 moreover a slightly smaller number of urination were registered during summer season of 7.35 per 24 hr in dairy cow (Acatincai *et al.,* 2011).

3.3 Reproductive Behavior

Reproductive behavior is very important and is related to quality semen production in male and manifestation of estrus in females. Sexual behavior starts with onset of puberty mainly by hormone testosterone in male. Sexual behavior in male is measured by assessing libido or sex drive. Sex drive is willingness and eagerness of male animal to mount and attempt service to female. Libido and mounting capacity influence the fertility rates of herd (Santos, 2001; Menegassi and Vieira, 2006). The mating/mounting behavior of bull was closely related to the LH surge of the receptive cow (Umezu *et al.,* 1981). Bull sexual behavior can be stimulated by estrus specific molecules identified in cow urine like 2-butanone and oleic acid by significantly lowering reaction and ejaculation time (Le Danvic *et al.,* 2015).

3.3.1 Sexual Activity in Male comprised of

a. Threatening and displaying
b. Challenging and contesting
c. Signposting and marking
d. Searching and driving
e. Nudging and tending

3.3.2 Measurement of Male Libido

a. Number of ejaculation in a exhaustive trial
b. Measurement of reaction time i.e. delay before ejaculation or latency of ejaculation (Table 2-3).
c. Proportion of failure to mount
d. Proportion of failure to ejaculate

3.3.3 Pattern of Male Sexual Behavior

Male sexual behavior includes sequence of behavior elements like courtship, erection, protrusion, mounting, intromission, ejaculatory thrust, ejaculation and refractory period (Chenoweth, 1983; 1997). Normal mating behavior in bull is stimulated by visual and olfactory cues (Chenoweth, 1983). The sexual behavior index was more consistent than the libido and mating ability indices especially in bulls (Anzar *et al.*, 1993). Breeding soundness evaluation in bull should be based on sexual behavior assessment such as libido and mounting capacity tests. Previous experience of bull is one of the important aspects for breeding soundness evaluation in bulls (Boyd *et al.*, 1989).

Table 2: Measurement of Male Libido

Sr. No	Age of bull	Reaction time
1.	4 years and above	12 min
2.	Under 4 years	5 min

Table 3: Measurement of reaction time i.e. delay before ejaculation or latency of ejaculation

Sr. No.	Temperament of bull	Reaction time
1.	Stable	12 min
2.	Aggressive	5 min
3.	Apprehensive/ fearful	44 min
	No. of attempt	Reaction time
4.	1st ejaculation	12 min
5.	2nd ejaculation	15 min
6.	3rd ejaculation	30 min

3.3.4 Breeding Soundness Evaluation in Bulls (Menegassi *et al.*, 2011):

Step I- General physical examination
Step II- Genital tract examination
Step III- Semen evaluation
Step IV- Behavioral assessment libido and mounting capacity to complete copulation.

Pheromone: Used to attract opposite sex and perform flehman's response. **Flehmen's response:** Curling of upper lip so as to expose gum regions and vomeronasal organs to animal secretion or pheromones.

3.3.5 Sexual Behavior in Female Cow

Sexual behavior in cow is commonly known as estrous behavior. Female sexual behavior clearly indicated by

a. Attractiveness: Extent to which female evoke sexual response to male
b. Pro-ceptivity: Extent of invitation or soliciting behavior.
c. Receptivity: Willing of female to accept courtship and copulatory attempts by males

Estrus: Estrus is physiological behavior caused by a feedback mechanism through which the estradiol act on the CNS. Active mounting corresponds to physiological states when progesterone is at basal level and estradiol is elevated (Glencross *et al.*, 1973). It is physiological state during which the females seeks and accept the male. Two types of changes observed i.e., physiological changes and behavioral changes. Vocal behavior rises during estrus. Animals are hyper reactive, it respond to environmental stimuli which ordinarily would have been ignored. Relative social hierarchy position is temporarily overlooked as animal approach those with higher or lower rank. Agonistic behavior is more visible during the period. Grazing and feeding time interrupted and rumination time reduced. Grooming activity in the form of licking other animal rises. Increase in mounting activity, homosexual behavior and standing to be mounted is very common sign. Cow stands to be mounted is known as "mountee". Mounting is behavior in female shown to catch the attention of male. In a large herd, females in heat form a temporary group known as SAG (sexually active group) by average 6 females. Average mount performed is 25 (range 0-91) during a single estrus period. 50% of mounting occur in outdoor dry lot area under best footing and less crowding. A male licking and sniffing a cow examines the chemical signals related to the progress of estrus (Knopski and Koberda, 2003).

3.3.6 Mounting Behavior Affected by Following Factors

a. **Number of animals in estrus:** More numbers of animals in heat mounting behavior is more intense.
b. **Floor surface type:** Slippery surface affect mounting behavior negatively.
c. **Group size:** Large group of female in heat more mounting observed however with overcrowding less mounting was observed.
d. **Weather condition**: Inclement weather suppresses mounting behavior in females especially the rainy days.
e. Managemental activities: Fewer mounting observed during milking and feeding as compared to resting and loafing period.

3.4 Care Giving/ Epimelitic Behavior

Care giving behavior is mostly maternally oriented, which stimulates suckling and protection

from peril. Care giving behavior is related with survival of young ones. As high survival rate depends on attention of dam to calf (Grandinson, 2005). In some species of bird both parents are involved in epimelitic behavior, however in farm animal dam alone contributes to nursing and caring calf, therefore in farm animals said behavior is called maternal behavior. Under weaning system especially zero day weaning, maternal care is sole responsibility of handlers. Mothering ability is one of the important criteria for selection of high grade dam especially in farm animals like sows. These behaviors allow the cow to bond with her calf, protect and provide it with nourishment and ultimately break down this bond at weaning. Five minutes contact after birth between cow and calf develop very strong bond which is enough to withstand after 12 separations (Hudson and Mullord, 1977). Different production systems have call attention to different maternal behaviors; some viewed it as advantageous while others considered an obstacle. In extensive system of production newborn largely reared by cow and common risk factor like cross licking, which affect maternal bonding is one of the important practical challenges. Hormones related directly to maternal behavior in all mammals (Gonzalez-Mariscal and Poindron, 2002; Poindron, 2005; Williams *et al.,* 2001).

3.4.1 Maternal Behavior During and After Parturition

Isolation behavior from herd mates before parturition in cow is very clearly defined (Lidfors, 1994). Cow prefers to select dry place for calving. Majority of cow prefer indoor as parturition site as compared to paddock (Edward, 1983). Cow generally prefers afternoon and early evening hours for parturition. Time spent in standing increased before calving in cow (Huzzey *et al.,* 2005). Most of the cow favors recumbent posture for calving (Edward and Broom, 1982). Cow stands after parturition to make physical contact with their calf, cow stand after parturition until suckling by calf (Selman *et al.,* 1970).

3.4.2 Licking Behavior Cow

Licking of newborn calf by mother is often considered essential for bonding between dam calves due to olfactory labeling through licking and nursing (Gubernick, 1981). Rejection of licking is common in uniparous as compared to multiparous cows. Cows start licking 1-7 min after birth (Vandenheede *et al.,* 2001). Grooming is common for about 1 hour (Kovalcik *et al.,* 1980) of birth. Multiparous cows groom more as compared to heifers. Grooming helps in stimulating breathing, circulation and defecation in calf. Licking is also common in sheep goat after parturition (Val-Laillet *et al.,* 2004). Cross-licking may be a risk factor for calf rejection. Need of the hour is to shift direction of research to understand how housing and management can be modified to reduce risk of calf rejection.

3.4.3 Expulsion of Placenta

Actual parturition completed only when placenta is expelled by cow in 2-6 hrs of parturition (Edward and Broom, 1982). Placentophagia is common in cows. Cows show more interest in amniotic fluid as compared to actual placenta. It might be due to amniotic fluid has some analgesic properties which further helps cow in expression of maternal behavior (Machado *et al.,* 1997). Flehmen response is common in cow associated with licking and sniffing the calf for pheromones (Ruckebusch *et al.,* 1991). Flehmen reaction is common in cows even with amniotic fluid of other cows.

3.4.4 Dam Calf Bonding

Licking of the new born calf by mother is often considered essential in establishing the maternal filial bond using calf odor (Illman and Spinka, 1993). Quiet grunting sounds are common in first few hours after calving and these calls are essential in bonding allowing the calf to recognize the cow's voice (Barfield *et al.,* 1994). Cow and calves respond behaviorally to each other's call and calves respond preferentially to calls from their own dam (Marchant-Forde *et al.,* 2002).

The selective nursing depends primarily on the main olfactory system since pre-partum peripherally induced anosmia prevents the establishment of selective nursing (Griffith and Williams, 1996; Levy *et al.,* 2004; Poindron *et al.,* 2007) in doe. This olfactory learning process is modulated by vagino-cervical stimulation (VCS) resulting from delivery of fetus naturally and involves the main olfactory system (Romeyer *et al.,* 1994). Cow seems to initiate nursing event within the first weeks of life, but as calf ages nursing are initiated by the calf (Lidfors *et al.,* 1994). Nursing frequency decreases with increasing age of calf. Calves solicit maternal contact by vocalizing, nuzzling and butting the cow's udder; these signals provide reliable information regarding the requirement of maternal care by calf especially in hunger calf (de Passille and Rushen, 2006). Some mother can respond with an increase in peripheral oxytocin levels following exposure to olfactory, acoustic or visual cues from their kids (McNeilly, 1972).

Feed intake in young one rises when kept with mother perhaps due to young are better able to mimic adult feeding behavior (Napolitano *et al.,* 2003). Cross fostering using wetting a calf's coat with amniotic fluid

will induce licking by the foster mother which further improve bonding (Hudson and Mullord, 1977). Skin grafting of dead calf onto foster calf helps in acquaintance between dam calves (Gonyou and Stookey, 1987). Presence of the young and or suckling can delay the recovery of sexual activity (Delgadillo *et al.,* 1998).

Weaning is successful if practiced on 0 day as compared to 4 and 30 days might be due to increased maternal-calf bonding before separation (Weary and Chua, 2000) shown by vocalization and increased activity. Weaning can be successfully carried out with continued contact as compared to complete isolation without nursing (Price *et al*., 2003; Haley *et al.,* 2005).

4.5 Care Soliciting/ Et-Epimelitic Behavior

Care soliciting is characterized by young crying for help when distressed, disturbed or hungry and their vocal sounds. Care soliciting means attention catching behavior. Many young animals are unable to protect themselves, therefore they give signal to help especially by vocal behavior. However, it is difficult to differentiate between different class of voice i.e., against danger or hunger or thirst etc. Calf use to bawl against problems and its loudness measures the intensity of stress.

4.6 Agonistic Behavior

These behaviors include fright, fight and flight reactions related to conflict. Agonistic behaviors are those behaviors which cause, threaten to cause or seek to reduce physical damage. Fights are ritualized and involve behaviors as threats, butts and head to head or head to neck contacts (Bouissou *et al.,* 2001). Agonistic behavior is common among males. The purpose of conflict is generally for dominance for choice of mate, feed and shelter. Bull paws the ground, marking the territory by urination and defecation and bellowing is common agonistic behavior to prove dominance in niche area. Establishing social dominance include offence, defense, escape and passivity. Under loose housing condition aggressiveness for food is significant especially when there is lack of proper manger space for each animal. Only aggression and not submission or other agonistic behavior components are measured, incomplete description of behavior are reported and complete quantitative ethogram did not form the basis for selection for particular behavioral measures (Mc Glone, 1986). Aggressive individuals were likely to be the winner in fighting in group clash (Sartori *et al.,* 2014). In cattle more frequent and longer agonistic displacement are observed in Herens cows when they are re-introduced within their herd after longer periods of separation for calving (Castro *et al.,* 2012). The behavior was expressed more during pre-partum and lactating dairy cows in first three days after regrouping (von Keyserlingk *et al.,* 2008; Schirmann *et al.,* 2011). Such situations may increase the social stress and the occurrence of physiological responses to chronic stress (Boe and Faerevik, 2003). Increasing feed alley space from 0.5 m to 1.0 m per animal for dairy cows was beneficial to wellbeing by enabling them to better maintain their individual space by reducing the display of aggressive behavior by 120% (McLean, 2003).

4.7 Allelomimetic Behavior (Herding behavior)

This behavior provides *social facilitation or allelomimicry* to the herd mates when enough resources are available (Faerevik *et al.,* 2008; Gygax *et al.,* 2007). Social facilitation defined as any increment in activity resulting from presence of other individual. If two or more than two animals doing the same thing at same time, the average activity rises due to mutual stimulation at the end (Dostalkova and Spinka, 2010; Ramseyer *et al.,* 2009; Sarova *et al.,* 2010). Animals' eats in group eat more as compared to individual feeding separately. Therefore animals in herd are more protective, healthier, contended and productive. Milking in group is more productive, less fearful and more docile. Animals if separated from herd or flock, animals become depressed frightened and agitated. Social function is common in group and animal fills comparatively safer. When one animal of herd see the threat, all other animals were vigilant accordingly. Under domestic situation man protect animals from predators but still allelomimetic behavior act. In case of single animal keeping social facilitation is not possible, still human companion may affect the behavior in positive direction. While passing from an unknown territory, single animal walk slowly and hesitantly but animals in group move very fast due to fear of separation from group. The handlers use to sit on fast stepping horse and rest of member follow the leader horse. Cattle herd at pasture are highly synchronized in their lying behavior and cattle show more postural similarity with their nearest herd mate than with a random member of the herd (Stoye *et al.,* 2012) suggesting allelomimetic behavior as well as concurrent feeding and lying cycle.

4.8 Shelter Seeking Behavior

All species require comfortable place for shelter and resting area. However in domestic condition they have to live which is provided by human being. If given opportunities they have ability to select appropriate environment. Cows are more comfortable in loose housing in summer and rainy season while in winter season cows were more comfortable with loose housing with central shed (Sharma and Singh, 2002).

Excessive protection of closed housing resulted in considerable panting. Shelter seeking behavior moves around following points:

a. Shade for rest and rumination
b. Wet areas for cooling
c. Crowding during cold condition

Individual outdoor sheds under shelter and calf house from light weight steel construction was superior over indoor system of housing in calves especially with respect to lying and eating time and thermal comfort of stabled animals (Palka *et al.*, 2013).

4.9 Investigatory or Exploratory Behavior

Investigatory behavior based on curiosity in animals. All animals have tendency to explore their environment by use of sense organ i.e., smell, sense, touch. Large farm animal do exploration with eye too. Sense of smell is very pertinent in dog especially with respect to tracking and exploration as per training provided.

4.9.1 Other Behavior: Like **Communication** i.e., transfer of information through any of the senses.

4.9.2 Resting Behavior

Resting behavior is one of the most important behaviors with a big influence on the animal production. Farmers are interested in having cows or calves that rest as much time as possible. Duration of resting was more during night. In winter season the total time spent in resting by 6 month old calf was 46.4 minutes in morning, 36.3 minutes in afternoon and 132.7 minutes during the night (Acatincai *et al.*, 2010).

It is well established fact that cow which lie down for 12 to14 hrs/24 hrs (Drissler *et al.*, 2005) are more productive than those with lower lying times. Increasing lying time may increase rumination, improve rumination status, increase blood flow to mammary system, reduce stress on hoof and reduce the incidence of lameness. When a dairy animal lying down, around 22 percent more blood is flowing through her udder than when she is standing (Rolquin and Caudal, 1992). This suggests that for extra hours she lies down (maximum up to 14 hrs), produces additional milk.

On farm welfare assessment protocol include resting behaviors like duration of lying down, percentage of cows lying partly or completely outside lying area and percentage of collision during lying down recorded within 2 h during a farm visit (Plesch *et al.*, 2010). Cows prefers left side laterality i.e., they prefer to lie on their left side on a level surface (Arave and Albright, 1981) especially when approaches parturition. It is important in ruminant animals for rest and optimizing position of rumen within the body for efficient rumination.

4.9.3 Behavior during Handling and Restraint

Animals remember positive and negative experiences. All depends upon the handlers and facilities. Knowing and understanding behavior will reduce stress on the producer and the animal and preventing exposure from injury.

5. Measuring Behavior Using Ethogram, Kinetmatic Diagram and Time Budgets

5.1 Ethogram

Ethogram is catalogue or inventory of behaviors or action i.e. ethogram is the complete basic data of an animals action pattern. Specialized ethograms are obtained that are valid for certain individual in specific context. The ethogram is also different with stages of life or sex of individual. The exhibited ethogram should be mutually exclusive and objective.

a. **Focal (continuous sampling):** Here a single individual is picked and recorded behaviors for a set of period
b. **Scan sampling:** In this methods a large number of organism for a short period and recording the number of behavior of individual doing each kind of behavior

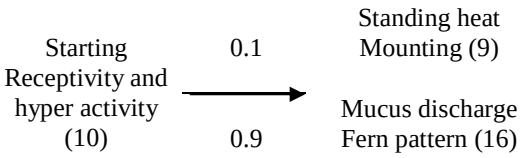
5.2 Kinematic Diagram

For recoding full behavior profiles of animals we need to record sequence of data. The ultimate goal will be to produce a diagram that summarizes the likelihood of various behavioral sequences. This type of diagram is called Kinematic diagram. We can use the observed sequence of action patterns to construct a matrix that list the number of times.

A kinematic diagram simply shows the flow of the behavior. Making one is like constructing a puzzle. Start with any behavior of estrus suppose, heat is started with standing heat which was followed by 10% of the time by standing heat and mounting and 90% of time by mucus discharge and fern pattern.

5.3 Time Budget

An ethogram gives us a list of characteristics action patterns of an animal and kinematic diagram gives an excellent overview of behavioral sequences and how frequently certain behavior occur. However, neither really tells us regarding time spent by animals in performing each behavior. Time budget is therefore very useful for understanding time spent in different behavior round the clock (Table 4).



The direction of arrows indicates which behavior leads and which follows.

Table 4: Time spent in different behavior round the clock

Sr. No.	Activity	Time devoted to activity per day
1	Eating	3-5 hrs
2	Lying or resting	12 hrs for average cow 14 hrs for elite cow
3	Social interaction	2-3 hrs
4	Rumination	7-10 hrs
5	Drinking	30 minutes
6	Managemental activities	2.5-3.5 hrs

Time out of the pen milking, stall base type and lameness significantly affect time budgets of cows (Gomez and Cook, 2010) especially lameness was associated with an increase in time standing in stall and reduction in number of lying bouts per day from 13.2 to 10.9 bouts/day.

5.4 Energy Budget

Energy expended in performing various activities. Sexual activity of animals contributes 25% of their total energy during estrus. They do this in about 25 minutes (less than 2% of the day), on this basis reproduction is supposed to be the non essential activities.

5. Conclusion

Different system of animal behavior in domestic animals helps us to understand animal need, status of animals and comfort. Resting behavior, maternal behavior and estrus behavior are one of the important behaviors of cow as it is controlled by hormones and pheromones which ultimately affect production and reproduction. Preventing normal care giving or maternal behavior seems to interfere with licking of calf and formation of cow-calf bond. Cervico-vaginal stimulation is very important for expression of maternal behavior properly. Social facilitation is common when related animals are kept in congenial environment which ultimately improves quality and quantity of production from the animals. Climate change and global warming affects production and comfort in animal. Production per animal is often used as an indicator of animal health. In most situations, welfare oriented environmental friendly production system is desired which will shift the system towards sustainability.

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