

ANIMAL HEALTH UPDATES

Animal Health Group

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Understanding bovine signals for better dairy husbandry

Introduction

Bovine comfort has been one of the topics in focus in recent years in dairy husbandry. Apart from the increasing consumer awareness on issues related to the well-being of the livestock whose products they consume, its effect on various important production parameters are also profound.

The animal is able to communicate its well-being through a plethora of signals that the farmer consciously or unconsciously interprets as good or bad.

Interpreting bovine signals which have been time tested and are measurable would be

an important milestone in developing the 'gut feeling' of the farmer regarding the health and well being of his/her animal into a more resolute and correct understanding of the state of the animal.

Signals are their relevance

Various types of signals reflect different aspects of management like feeding, housing, space availability, routine changes, health, hygiene etc and, also indicates the normal physiological and other biological signals, any deviation of which should be investigated thoroughly. A list of such signals and their relevance is given in the table below.

Signals (Indices in parenthesis)	What does it indicate?
Body Condition (Body Condition Scores)	General health corresponding to stage of lactation, feeding practices, probability of occurrence of metabolic diseases or reproductive conditions post calving etc
Health signals	Feeding and management practices
Physiological signals	Health, feeding practices, diseases, metabolic conditions, heat /cold stress, changes in routine, deficiencies, housing , insect menace etc
Calving signals	Normal calving patterns, abnormal patterns that require immediate attention.
Calf signals	Normal calf signals, abnormal signals that require special attention
Feet & locomotion signals (Feet & Locomotion Scores)	Feeding, hoof management, flooring, housing etc
Rumen fill signals (Rumen Fill Scores)	Ailments, feeding etc
Feeding and manure indices (Manure consistency and Digestibility Scores)	Imbalance in ration formulation, metabolic diseases
Hygiene & teat health (Hygiene and Teat Scores)	Cleaning, housing and milking practices
Heat stress signals (Panting Scores)	Level of heat stress

A. Signals of a healthy animal

The cardinal signs of health are important to make a general assessment of the health status of an animal or a herd. Any deviation from normal signs should be investigated further. The general signs of health are described in the table below.

B. Physiological signals

The normal physiological signals that can be measured are temperature, respiration, rumination, defaecation, urination, feeding, drinking, salivation, milk production, behaviour and heat signs. Deviations can be broadly related to management practices or diseases.

Description	Signals of health
Eyes	Bright, clear and not runny (no discharge), crusty or bloodshot
Muzzle	Cool & moist with frequent licking; breathing should be regular and not laboured.
Coat	Glossy, clean and un-matted, free of ticks/lice, other parasites or eruptions.
Weight	Average weight for the breed; should not be emaciated or thin animals.
Attitude	Curious, alert and contented; animals should not stand apart from the herd, seem disinterested or show signs of a bad temper.
Mobility	Walking should be easy and free of limps; should not have slow or uneven gaits or hunched positions when sitting; the animal should be able to rise from seated positions with ease.
Udder	Size isn't necessarily an indicator of a good udder. It should sit forward with prominent milk veins, not sag and not be too meaty. Observe the cow when she walks, the udder should not show too much sideways movement.
Body score	This is an important indicator of the health of the animal. An animal in good health will have a body score between 2-3 (based on stage of lactation and pregnancy status)

(i) Temperature

- Normally between 38 to 39 °C.
- Reading to be taken ideally during early morning or late evening/night.

Action triggers:

1. High temperature (may be accompanied by breathing, shivering and occasional diarrhoea): *Infection, heat stress, hyper excitability.*
2. Low temperature (Hypothermia): *Milk fever, shock, exposure to extreme cold.*

(ii) Respiration

- Normally is 10-30 times (breathing in + breathing out) per minute in adults.
- 30-50 times per minute in calves.
- Observed best from the animal's right flank, seen from behind.

Action triggers:

1. Increase in respiration rate: *Fever, heat stress or when the animal is in pain or excited.*
2. Decrease in respiration rate: *Milk fever and shock.*
3. Laboured breathing: *Blockage in nasal passage, shock.*

(iii) Rumination

- Normally not less than 40 times per minute and 7-10 hours per day.
- Rumen motility (RM) is 1-3 per minute.

Action triggers:

1. Decrease in rumination: *Inadequate rations, other ailments.*
2. Decrease in rumen motility: *Milk fever, acidosis, infections.*

(iv) Defaecation

- Normally occurs around 15 times a day
- Quantity based on body weight at around 20-25 Kg for a 350-400 Kg animal.
- Manure score should be around 3 (see manure consistency scoring)

Action triggers:

1. Decrease in rumination: *Inadequate rations, other ailments.*
2. Decrease in rumen motility: *Milk fever, acidosis, infections.*

(v) Urination

- Normally occurs around 10 times a day
- Quantity based on body weight at around 10-15 litres for a 350-400 Kg animal.

Action triggers:

1. Decrease in urination: *Inadequate water, milk fever,*

kidney problems.

2. Difficulty in urination: Urinary infection, urinary calculi.

3. Change in urine colour: Urinary infection, babesiosis, water engorgement, urinary calculi.

(vi) Feeding

- Normally feeds around 5 hours a day, buffaloes feed for more time.
- Feeding is spread out over 10-15 meals.
- Rumen fill score should correspond to the stage of lactation. (see rumen fill score)

Action triggers:

1. Decrease in urination: Inadequate water, milk fever, kidney problems.

2. Difficulty in urination: Urinary infection, urinary calculi.

3. Change in urine colour: Urinary infection, babesiosis, water engorgement, urinary calculi.

(vii) Drinking

- Around 3 litres of water is required for every litre of milk produced, requirement increases in summer.
- An animal can drink about 20 litres of water a minute.

Action triggers:

1. Reduced milk production & water engorgement: Non-availability of clean drinking water 24x7.

(viii) Salivation

- Around 40-150 litres of saliva is produced per day based on type of ration given and consumed.
- Roughages causes production of more saliva while concentrates reduce it.

Action triggers:

1. Increased salivation, drooling, frothiness: Feeding coarse materials, lesions in mouth and buccal cavity, FMD.

(ix) Milk Production

- Peak yield is reached 1-2.5 months after calving.
- Heifers peak at 75% and at 90% in 2nd calving in comparison with mature cows.

Action triggers:

1. Sudden reduction in milk production, difficulty in milking: Change in milking routine (buffaloes take longer time to get used to new routines), change in feed/feeding pattern, animal in heat, milk fever, ketosis, mastitis and other infections

2. Change in colour of milk: Mastitis, phosphorous deficiency, teat injury, other infections.

(x) Behaviour

An animal spends 3-5 hours eating, 12-14 hours lying/resting, 20-30 minutes sleeping, 2-3 hours for social interactions (grooming etc), 7-10 hours ruminating & 20-30 minutes drinking.

Action triggers:

1. Hyper-excitability: Change in milking routine, nuisance from biting flies, heat, CNS diseases, ketosis, hypomagnesaemia

2. Reduced response: Milk fever, severe infections, shock.

3. Drastic change in activity times: Issues with feeding, housing, lack of space.

(xi) Maturity

- Heat signs in cross breeds are seen around 18 months, around 2.5 years in indigenous breeds and, 2.5-3 years. In buffaloes.
- Heat is less pronounced in buffaloes.
- First heat after calving is seen 40 days post calving.

Action triggers:

1. Anoestrus: Under-nourishment, worm infestation, failure to detect heat (silent heat), mineral deficiency.

2. Post-calving anoestrus: Energy deficiency, mineral deficiency.

C. Calving signals

- The average gestation period of cattle ranges from 280-290 days and buffalo, 305-318 days.
- Normal calving can be divided into 3 stages: **Stage 1**: 24 hours before calving; **Stage 2**: Delivery of calf and **Stage 3**: Expulsion of placenta.



Raised tail head, mucous discharge from vulva, udders filled with milk are signs of onset of calving (Stage 1).



Stage-2 begins with appearance of water bag. Cows with normal calf presentation usually deliver within 30 mts-1 hour after the water bag bursts. Heifers may take up to 4 hours. **Animal in labour for over an hour with no signs of water bag appearing requires immediate attention.**



Stage 3: Placenta is normally expelled within 3-8 hours. If retained more than 12 hours, it is termed as Retention of Placenta (ROP).

- Improper handling of ROP may lead to severe complications that could be fatal.
- Never try to forcibly remove the retained placenta since it may cause severe bleeding and lead to serious complications.

D. Calf signals

- Healthy calves stand up within minutes of calving and start suckling within 1-2 hours.



A calf that had a difficult calving will have swollen head or tongue and meconium staining of perineum/body and reduced vigour and motivation to nurse. **They require special attention.**

Calves with raised and wagging tails (arrows) while nursing indicates proper closure of oesophageal groove, which allows al-



lowing milk to go directly into the abomasum and thus avoids it from being fermented. Abnormal signs in calves need to be taken due note of since delaying action may prove fatal. Some abnormal signs in calves that need immediate attention are given in the

table below:

Abnormal signs/action triggers	Probable cause(s)
Does not stretch its legs when aroused after a lengthy rest	Often the first sign of ill health
Kicking belly with hind legs	Indicates pain in abdominal area due to various g.i disturbances
Grinding teeth	Pneumonia/scours/bloat etc that has taken a serious course.
Diarrhoea	G I tract infections, improper closure of oesophageal groove.
Unable to stand	Injured knee, displaced joint, infected navel, weakness, Vit E/selenium deficiency etc
Facial hair standing on end	Impending digestive disorder, chronic pneumonia
Sunken eyes and loss of skin flexibility	Dehydration usually following diarrhoea
Pot belly	High fibre and low energy diet, internal parasites.
Bloating after drinking milk	Improper closure of oesophageal groove due to rough handling, feeding milk that is too hot/ too cold , force feeding or overfeeding etc
Dry muzzle, droopy ears	Fever
Standing with legs spread and extended head	Lengthy bout of pneumonia

E. Feet and Locomotion signals

- Normal stance of hindlegs (Leg score 1) : The hind legs are parallel to the spine with no degree of outward rotation when viewed from behind.
- The normal gait of an animal (Locomotion score 1): Stands and walks with a level back, bears weight on all legs evenly, joints flex freely, head carriage remains steady as animal moves.

Action triggers: Any form of lameness. (refer the locomotion and leg score chart), lack of confidence while

walking on shed floor, knee, hock or leg lesions, lesions in the neck region, overgrown hooves etc.
Probable reasons: Lack of sufficient space to lie down and to move about, sub-clinical acidosis resulting from increased concentrate feeding in relation to roughage, very slippery, uneven or rough flooring, improperly placed manger/railings. Improper hoof management.

F. Feeding Signals

- Appropriate rumen fill score based on the stage of lactation (refer rumen fill score)
- Body Condition Score (BCS) of animal at the time of calving should be around 3 (not less and not more)
- BCS should not go below 2 during any stage.
- Manure Consistency Score (MCS) should be around 3 and Digestibility Score (MDS) 2-3 based on stage of lactation (refer manure digestibility and consistency scores)

Action triggers:

1. Rumen fill score not corresponding to the stage of lactation: Metabolic or other ailments, inadequate feeding.
2. Low BCS: Poor health condition, chronic diseases, inadequate feeding.
3. High BCS: Gives a fair indication on chances of occurrence of metabolic problems & placental retention at calving and breeding problems.
4. High MDS: Imbalance in ration formulation.
5. Low MCS: Acidosis, high concentrates, chronic gastro-intestinal diseases like JD etc
6. High MCS: Excess fibre, hypocalcaemia, ketosis.

G. Hygiene signals

- Hygiene score should be 1: There should be no dirt present or only minor fresh or dried splashing present on lower hind leg, tails and udder. (refer hygiene score)

Action triggers:

Dried dirt found on tail, lower hind leg and udder: Lack of adequate space, improper shed cleaning, improper manure consistency etc. Increased chances of occurrence of mastitis.

H. Teat health signals

- Teat score should be 1: Teat end should be smooth with no calluses (refer teat score)

Action triggers:

- Teat scores of 3-4: Improper milking practices, improper use of milking machines
- Cracks on teat skin: Dryness

H. Heat stress signals

- The animals should not have a panting score of above 2. The panting scores and related signs are as follows:

Panting	Breaths/	Status
0	<40	Normal
1	40-70	Slight panting, no salivation, chest movement seen.
2	70-120	Fast panting with salivation but with mouth closed.
2.5	70-120	As for 2, with mouth open but tongue not extended
3	120-160	Open mouth with some drooling. Neck extended and head up.
3.5	120-160	As for 3 but tongue out slightly, occasionally extended for short periods and excessive drooling
4	>160	Open mouth with tongue fully extended for prolonged periods and excessive drooling

SCORING TO QUANTIFY SIGNALS

The quantification of various signals is possible by developing a scoring pattern for each signal which have been elucidated below:

1. Body Condition Scoring (BCS):

BCS is a very important aspect in metabolic diseases and has significant relation to health, production and reproduction. The BCS difference between parturition and 1st service should be limited to 0.5 BCS for best results. Scoring done on a scale of 1 to 5.

2. Rumen fill score: Scale of 1 to 5.

3. Locomotion score: Scale of 1 to 5.

4. Leg Score: Scale of 1 to 3.

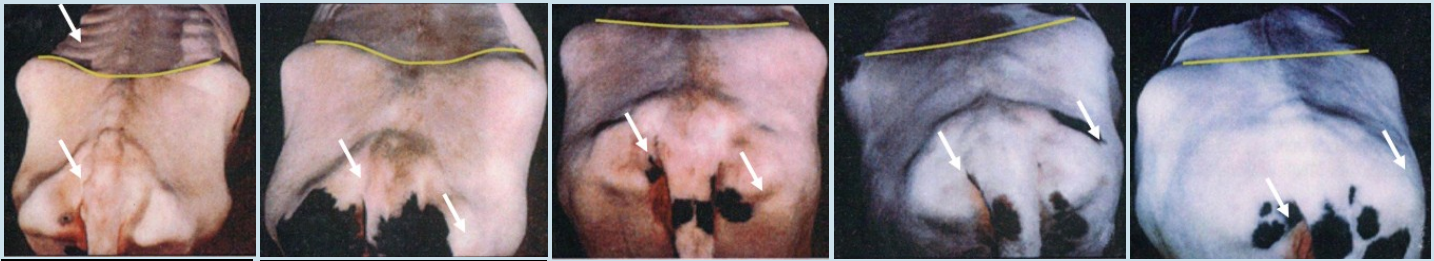
5. Manure Consistency Score (MCS): Scale of 1 to 5

6. Manure Digestibility Score (MDS): Scale of 1 to 5

7. Teat Score: Scale of 1 to 4

8. Hygiene score: Scale of 1 to 3

1. BODY CONDITIONING SCORE



Score 1: Tail head - Deep cavity with no fat tissue under skin. Spine prominent.

Score 2: Tail head - cavity shallow but prominent pin bones. Spine ends are rounded.

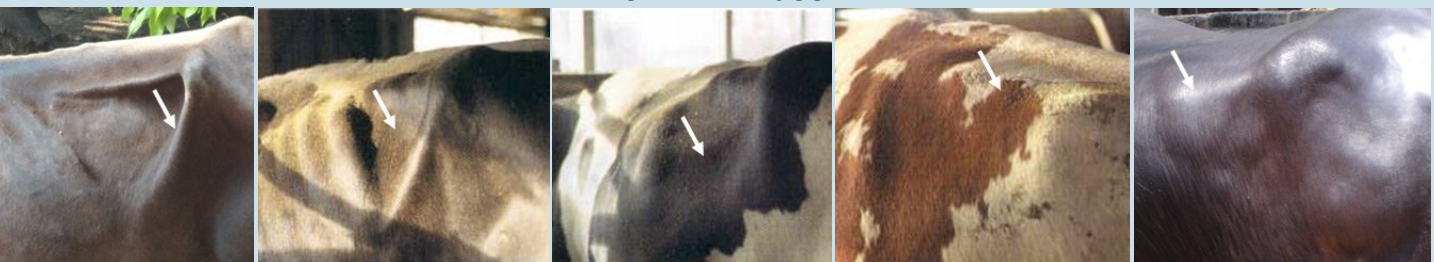
Score 3: Tail head - fat cover present. Some fat deposits around bone extremities.

Score 4: Tail head - Completely filled and folds evident. Bone extremities are rounded.

Score 5: Tail head - Completely filled and folds evident. Bone extremities are rounded.

An animal in the first few weeks of lactation may have a score of 2. At drying off, animals should have a score of 3. An animal with score of above 3.5 will have metabolic and breeding problems.

2. RUMEN FILL SCORE



Score 1: Vertical fold of skin seen down from the hip bon.

Score 2: The rumen pit gives a triangular appearance

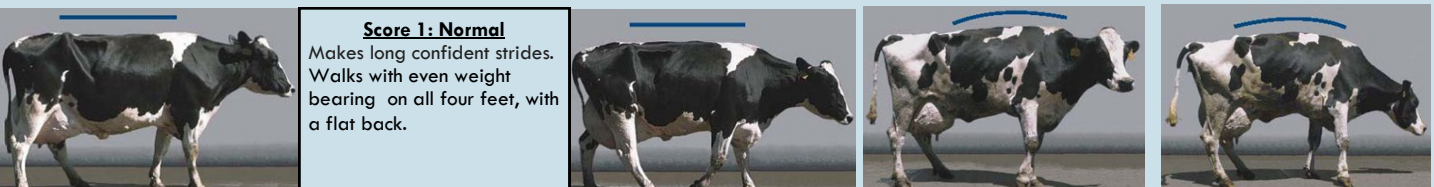
Score 3: Rumen pit behind the rib bow can be seen.

Score 4: No rumen pit is seen.

Score 5: The belly skin is strongly stretched.

Animals in the 1st week of lactation may have a rumen fill score of 2, 3 is the correct score for milking animals with good feed intake. Score 4 should be seen in animals at end of lactation and score 5 for dry cows.

3. LOCOMOTION SCORE



Score 1: Normal
Makes long confident strides. Walks with even weight bearing on all four feet, with a flat back.



Score 2: Mildly lame
Stands with flat back, but arches when walks. Gait is slightly abnormal. Affected limb or limbs not immediately identifiable.



Score 3: Moderately lame
Stands and walks with an arched back and short strides with one or more legs.



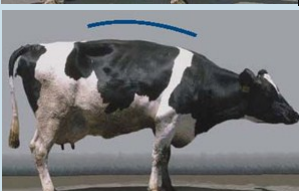
Score 4: Lame
Arched back while standing and walking but can still bear some weight on them.








Score 5: Severely lame
Pronounced arching of back. Reluctant to move, with almost complete weight transfer away from the affected limb.

4. LEG SCORE

•Leg scoring is a quantification of the stance of the hindlegs.
•The score is based on the degrees rotation from perpendicular (90°) when both legs point parallel along the backbone from the back to the front of the cow.
Score 1: 0° to 17° from 90°; this is the ideal situation.
Score 2: 17° to 24° from 90°
Score 3: more than 24° from 90°.



5. MANURE CONSISTENCY SCORE (MCS)


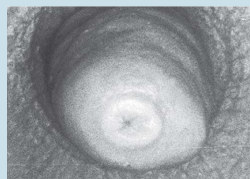
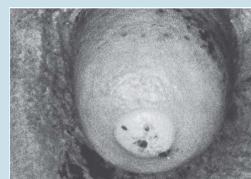

				
Score 1: Loose and watery, most probably due to gastro intestinal illness.	Score 2: Custard consistency, splatters far when dropped. Indicates ration imbalance.	Score 3: A pat 2-3 cm thick with a blob on top. Does not stick to footwear.	Score 4: The manure is thick, well formed and stacks in rings. Sticks to footwear.	Score 5: Almost forming balls. Footwear leaves an impression.

An MCS of 3 is ideal for a lactating animal. An MCS of 4 or 5 may be acceptable for dry cows or heifers. It also indicates imbalance in ration.




6. MANURE DIGESTIBILITY SCORE (MDS)

Score 1: The manure feels like a creamy substance and is homogeneous and very weak. The manure contains no undigested feed particles. <u>Ideal score for milking and dry animals.</u>	Score 2: The manure feels like a creamy emulsion and is homogeneous. The manure contains some undigested feed particles. <u>Acceptable score for milking and dry animals.</u>	Score 3: The manure does not feel homogeneous. Undigested parts can be detected. After squeezing and opening the hand, undigested fiber parts stick to the fingers. <u>Acceptable score for in-calf heifers and dry animals.</u>	Score 4: Large feed particles can be felt in the manure. Undigested parts are clearly visible. After squeezing and reopening the hand, a ball of undigested fiber remains in the hand. <u>Requires ration adjustment.</u>	Score 5: Large feed particles can be felt in the manure. Undigested parts from the ration are clearly recognizable. <u>Requires ration adjustment.</u>
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7. TEAT SCORE

			
Score 1: Smooth bottom, no or smooth callus. No lesions. <u>Ideal score</u>	Score 2: Smooth bottom, no or smooth callus. No lesions	Score 3: Rough callus with keratin growth	Score 4: Rough callus with keratin growth

8. HYGIENE SCORE

Score-1: Clean, no dirt or only very little fresh or dried dung present.	Score-2: Dirty, at least palm-sized dirty areas present.	Score-3: Very dirty, at least forearm sized dirty areas present.
		
Flank (including tail) Lower hind leg Udder	Flank (including tail) Lower hind leg Udder	Flank (including tail) Lower hind leg Udder