

10 pro techniques: Mastering the art of the bovine physical exam

Ryan M. Breuer, DVM, DACVIM-LAIM

Clinical Assistant Professor of Large Animal Internal Veterinary Medicine
School of Veterinary Medicine, University of Wisconsin-Madison
Madison, WI 53706

Key words: bovine, physical, examination, techniques

The bovine physical examination is viewed as a rudimentary skill utilized by the bovine practitioner, but this skill set, when performed with precision, detail and diligence, can provide information that will prompt further diagnostic testing as well as offer insight for making appropriate decisions on a diagnosis and prognosis for the animal being evaluated. Here, we'll break down the physical exam to review the components and focus on techniques to gather more information for a systematic approach to the physical exam.

Initial assessment and data gathering

Arriving ready to gather information on the patient is an important aspect for the bovine physical exam. The practitioner must be prepared by arriving with appropriate attire, personal protective equipment (PPE), as well as the necessary equipment needed for the physical examination including, but not limited to, a stethoscope, thermometer, examination gloves and rectal sleeves. Further materials may be needed after initial assessment and physical exam has been performed for further diagnostic workup. Equally as important as arriving ready to the physical exam, is for the practitioner to observe the animal's environment. Being able to see how the animal is interacting in that environment and how the environment is acting on the animal is a vital data collection technique. By observing the animal from a distance, information can be collected without disturbing or elevating physical vital parameters on the animal. The first step of the physical examination, evaluation from a distance, is important and may provide vital information for further workup. Evaluation from a distance can provide information on posture, attitude, and demeanor. Evaluation of body condition should also be noted (Figure 1). As an example, breathing patterns and respiratory effort can be elevated when working directly with the animal, so evaluation from afar will likely not interfere with this parameter. After evaluation from a distance, proper restraint of the animal should be achieved.

Vital parameters

Vital parameters taken during the bovine physical exam include: the temperature, pulse (heart rate), respiratory rate and rumen contractions. These parameters are commonly referred to as TPR-R. If possible, vital parameters should be taken prior to restraint. When restraint is necessary, vital parameters should be taken a second time near the end of the physical exam to rule out false elevations prompted by restraint of the animal. Table 1 provides normal cow and calf values at environmental temperatures $\leq 85^\circ\text{F}$. Keep in mind that ambient temperatures can influence these vital parameters and appropriate consideration should be given prior to diagnosing and treatment of the animal being examined. To accurately measure rectal temperatures, a thermometer that has a probe length of 4 in. (5 cm) should be used. Shorter thermometers are not long

enough to contact the rectal mucosa and they provide inaccurate/low readings. The temperature of an animal being evaluated can be variable and very dependent on environmental factors such as ambient temperature, feeding status and level of activity. It is important to realize that temperature elevation above 103°F is not always a considered a fever. Like rectal temperatures, the factors or environment and activity level also influence respirations and should be taken into account when obtaining this vital parameter. Increasing the frequency of respirations is the most efficient way of cooling in warm environments as well as increased physical activity. On the other hand, heart rate is quite consistent over a wide range of environmental temperatures, but may be elevated with increased physical activity.

Systematic examination

Front of animal examination

After the animal is restrained and vital parameters are taken, continue your "from a distance" evaluation by observing the animal head-on. When moving around to the front of the animal, note symmetry of the head, face and neck. Observe the animal closely for any ocular or nasal discharge as well as general appearance and attitude (manic vs somnolent). Keep close attention to the animal's cranial integument and musculature to identify any subtle abnormalities in facial symmetry and tissue innervation. Abnormalities may suggest cranial nerve deficits and prompt a cranial nerve workup. Note air flow through the nostrils and symmetry of the flow. Check the eyes for scleral injection, corneal deficits, inner ocular abnormalities, ocular discharge, and abnormal motor movements. Palpate the ears for changes in temperature has this could provide heightened attention to other areas of the physical exam while evaluating the rest of the animal. A full oral exam is sometimes appropriate to perform depending on the presentation of the animal. If not a major concern, the oral exam should be performed near the end of the physical so not to stress the animal out further for the rest of the workup. Structures to evaluate during an oral examination include the dental pad, dentition, tongue, oral papillate, as well as the hard and soft palate; this is especially important in the neonate to examine for congenital abnormalities.

Left side examination

After evaluating the head of the animal, continue along the left side noting ear carriage, eyes and submandibular regional lymph nodes. Palpate this structure to observe for pain and/or enlargement. When examining the neck inspect the jugular groove (venous pulsation) and prescapular lymph nodes for pain and/or enlargement. Perform a Withers Pinch Test to see if there is positive ventral flexion. If possible, auscult the thorax while performing a Withers Pinch Test and listen for an exploratory grunt. Response to this test may help you focus on further areas of the animal. Before evaluating the left lung fields, auscult over the trachea to observe respirations and sounds that

Figure 1: Body condition score chart for Holstein Dairy cattle. From: Edmonson AJ, Lean IJ, Weaver LD, Farver TB, & Webster G (1989). A Body Condition Scoring Chart for Holstein Dairy Cows. *Journal of Dairy Science*, 72, 68-78.³

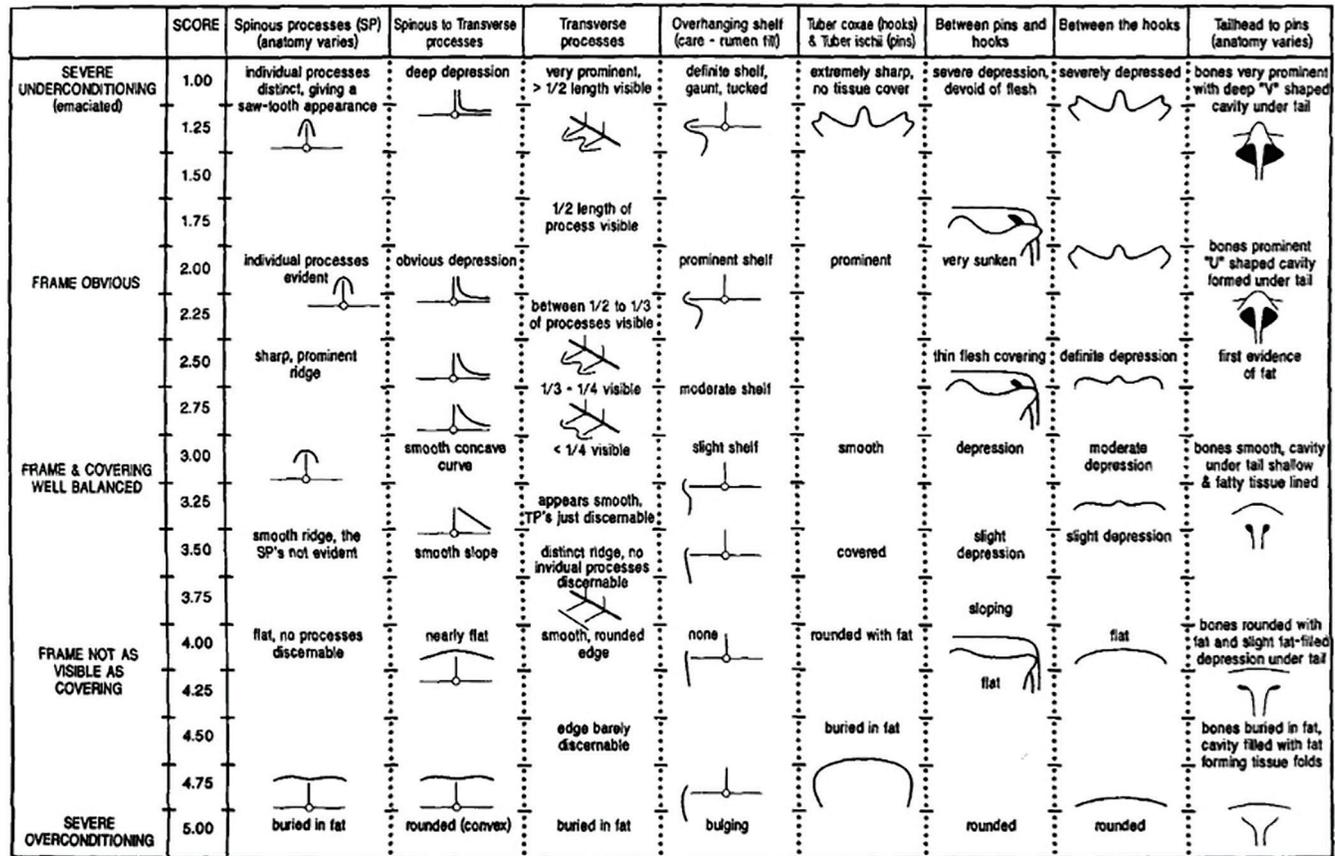


Table 1: Vital parameters of the physical exam. Adapted from the Merck Veterinary Manual¹ and Regan et al. *J Dairy Sci* 1938:21:73-79.²

Species of animal being examined	* Temperature reference ranges (°F/°C)	Pulse reference range	Respiratory reference range (breaths per minute [br/min])	** Rumen contractions (contractions per minute)
Adult cattle	100-103 / 37.8-39.4	45-85	15-50	2-3
Calves	101.5-103 / 37.8-39.4	65-100	20-40	N/A

* Relative to environmental conditions. Reference ranges above take into account an ambient temperature of ≤ 85° F (29.4° C).

** Appropriate listening time to the rumen is a period of 1-2 minutes.

could be referred from the upper respiratory tract. Provide compression to the trachea and shake to elicit a cough. In addition to determining the respiratory rate of an animal by observation "from a distance", the character and depth of breaths can be further assessed by careful auscultation. Normal respirations are characterized by thoracic movement with only a small amount of abdominal movement. Neither expiratory nor inspiratory phases of the respiratory cycle should be exaggerated and there should be a pause between breaths.

Identify the boundaries of the left lung fields carefully. Lung fields are defined dorsally by the edge of the epaxial muscles, the anterior border is defined by the triceps of the forelimb, and the ventral border in an adult cow it is defined by the 11th intercostal space (ICS) dorsal to the epaxial muscles, the 9th ICS

at the level of the mid thorax, and the 7th ICS at the level of the elbow. Auscult over the entire identified lung area, moving after 1 or 2 breaths in each location. Focus on direct auscultation of the cranial ventral left thorax as this gravity dependent area is more prone to disease processes. Heart auscultation done from the left side is performed with more ease, but does require that the stethoscope be pushed dorsal and cranial from the level of the elbow. The heart sounds are easier to be auscultated on the left side of the thorax. The pulmonic valve is best heard at the level of the 3rd intercostal space (ICS). The aortic valve is best heard at the base of the heart at the level of the 4th ICS. The mitral valve is best heard at the heart apex at the level of the 5th ICS. These points of maximum intensity are important for cardiac auscultation and determination of cardiac abnormalities.

Take your time and listen. Not only heart rate should be evaluated but auscultation for arrhythmias and murmurs should be performed as well.

While evaluating the thoracic cavity make sure to palpate the brisket to examine for any swelling, pain, and/or pitting edema. Examine the left forelimb and palpate it to observe for joint or limb swelling, heat, pain, bounding pulses, appearance of hoof surface deficits, abnormal claw confirmation, and interdigital space lesions.

Next, examine the abdomen. Rumen contraction rates should be taken in the left paralumbar fossa, and the practitioner should feel for consistency of rumen fill, contents and strength of contraction. Simultaneous auscultation and percussion should occur over the entire left abdomen as well as succussion for intraluminal gas and fluids, if indicated. While evaluating the abdomen, palpate the prefemoral lymph nodes for pain and/or enlargement. The ventral abdomen should also be palpated for edema and turgidity of blood vessels. From the left side, evaluate the front and hind quarters as well as the teats of the left side of the udder. Beside evaluating for swelling, pain, heat and redness, you may also assess milk secretions if necessary for evaluation and workup for the animal's presenting complaint. Finally, the left hindlimb should be examined similarly to the left forelimb by palpation to observe for joint or limb swelling, heat, pain, bounding pulses, appearance of hoof surface deficits, abnormal claw confirmation, and interdigital space lesions.

Right side examination

Moving around to the right of the animal, examine the right hindlimb similarly to the left hindlimb by palpation to observe joint or limb for swelling, heat, pain, bounding pulses, appearance of hoof surface deficits, abnormal claw confirmation, and interdigital space lesions. The right udder should be evaluated similarly to what was performed on the left side. Auscult the right abdomen for borborygmic activity while simultaneously listening and percussing the abdomen in the same manner as on the left side of the abdomen. Succussion should be performed to elicit evidence of gas and fluid accumulation within a viscus/lumen or evidence of pain during examination. As previously, palpate the prefemoral lymph nodes for abnormalities. Right lung field borders should be clearly defined as performed on the left. The right heart can be auscultated in a similar fashion to the left side of the heart. The tricuspid valve point of maximal intensity is heard over the right 3rd ICS. Again, auscult for not only heart rate but for abnormalities such as arrhythmias and murmurs. The right forelimb and joints should be examined as previously performed on the other limb. The right side of the neck should be evaluated in being careful to observe and palpate the jugular groove as well as periscapular and submandibular lymph nodes.

Examination from behind the animal

Return to the backside of the animal. There, the practitioner can palpate the tail for the coccygeal artery and pulse. This is another site to determine the pulse of the animal being examined. The coccygeal artery provides easy access for pulse rate determination. Hold the tail at the level of the ventral vulva and place fingers on midline until pulsations can be felt. For animals with cardiac disease or abnormalities on heart auscultation, it is beneficial to compare the heart rate to the coccygeal artery pulse rate. In females, vaginal mucus membranes can be used for evaluating for mucosal pallor and capillary refill time

(CRT). For males, oral mucous membranes or ocular membranes can be used for pallor and CRT evaluations. It is important to note that vaginal hemorrhage, mucosal lesions, and/or traumatic injury may prompt for further evaluation techniques as well as diagnostic testing. Rear udder symmetry, size, texture and palpation of the supramammary lymph nodes should be performed. Appearance of the general back side conformation, hips and pelvis for symmetry, should be evaluated to take into account any boney or muscular lesions.

Rectal examination

The rectal exam should be the final portion of the physical examination. The reasons for saving this portion of the exam until the end is to prevent a pneumorectum that may interfere with abdominal auscultation. It is also important to take a final rectal temperature prior to the rectal exam, as air brought in from the outside environment during rectal palpation may cause false readings while taking a temperature. When performing a rectal exam, safety of the animal and that of the examiner should be kept in mind. Adequate restraint is necessary. For a thorough rectal evaluation, clean the perineum and adjacent areas, especially when performing a vaginal exam. Perform the vaginal exam prior to rectal examination to reduce contamination of gastrointestinal flora to the reproductive tract. Before rectal palpation donning a full, disposable rectal sleeve for the dominant palpation arm should occur. Apply an abundant of lubrication to hand and arm before insertion to the rectum. This will minimize potential trauma and reduce straining, especially of a young age or smaller breed of animal. Proceed slowly to ensure minimal discomfort to the animal and maximum safety. Evacuate fecal material to aid in palpation of internal organs and structures. Assess internal organs and structures in a clockwise or counterclockwise manner. Palpate for normal and abnormal findings of the spine, kidney(s), loops of large and small intestine, internal lymph nodes, the pelvic brim, uterus, ovaries and associated structures, urinary bladder, and the rumen. Remove arm slowly and inspect the sleeve for blood and foul odor from fecal material. Collection of fecal material for diagnostic testing at this time is ideal.

Interpretations of abnormal vital parameter findings

Interpretations focus on broad possibilities and include, but are not limited to the following:

Temperature

Interpretation of hypothermia

- Thermometer doesn't make contact with rectal mucosa
 - ◆ Probe is not long enough
 - ◆ Thermometer malfunction
 - ◆ Thermometer is not in place for adequate time
 - ◆ Pneumorectum
 - ◆ Poor rectal tone
- Shock
- Dehydration
- Environmental cold extremes

Interpretation of hyperthermia

- Fever
 - ◆ Inflammatory response
- Exogenous causes
 - ◆ Increased environmental temperature and/or humidity
 - ◆ Increased activity
 - ◆ Environmental exposures
 - Dark colored cows without shade
 - Down cows that can't move out of the sun

Cardiac evaluation

Interpretation of tachycardia

- Excitement
- Pain
- Injury
- Inflammation
- Toxemia
- Dehydration
- Shock
- Disease
 - ◆ Infectious
 - ◆ Metabolic / electrolyte abnormalities
 - ◆ Inflammatory
 - ◆ Heart disease
 - ◆ Neoplasia

Interpretation of bradycardia

- Fasting (voluntary or involuntary)
- Disease
 - ◆ Infectious
 - ◆ Metabolic / electrolyte abnormalities
 - ◆ Heart disease
 - ◆ Neoplasia

Respiratory evaluation

Interpretation of tachypnea

- High environmental temperature and/or humidity
- Fever
- Excitement
- Respiratory disease
- Hypoxia
 - ◆ High altitude
 - ◆ Cardiac disease
 - ◆ Pulmonary disease
 - ◆ Shock
- Dehydration
- Toxemia
- Metabolic - acid/base status

Interpretation of dyspnea

- Painful conditions of the pharynx, larynx or thorax
- Severe, emphysematous and/or painful respiratory disease
- Upper airway obstruction
- Metabolic - Acid/Base status

Rumen evaluation

Interpretation of abnormal rumen motility

- Excitement, nervousness
- Pain
- Inflammation
- Fever
- Gastrointestinal disease
 - ◆ Peritonitis
 - ◆ Abomasal disorders
 - ◆ Indigestion
 - ◆ Bloat
 - ◆ Displacements
 - ◆ Obstructions
- Other disease conditions
 - ◆ Toxemia
 - ◆ Dehydration
 - ◆ Shock
 - ◆ Electrolyte abnormalities
 - ◆ Metabolic conditions
- Vagal indigestion

These proceedings coupled with the 2023 AABP Recent Graduate presentation "10 pro techniques: Mastering the art of the bovine physical exam", serve as review and reference of the bovine physical examination and how to hone in on areas which may provide the bovine practitioner more information on a workup of the animals being evaluated.

Acknowledgements

A special appreciation to UW-SVM clinicians and instructional support staff, past and present, who contributed large animal physical examination resources to the Herd Health and Physical Exam course. Merck Animal Health.

References

1. Aiello SE, Moses MA, Allen DG. The Merck Veterinary Manual: Merck & Company, Incorporated White Station, NJ, 2016.
2. Regan WM, Richardson GA. Reactions of the dairy cow to changes in environmental temperature. *J Dairy Sci* 1938;21:73-79.
3. Edmonson AJ, Lean IJ, Weaver LD, et al. A body condition scoring chart for Holstein dairy cows. *J Dairy Sci* 1989;72:68-78.

