

# Chute side (point-of-care) diagnostics in beef cattle practice

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## Abstract

Making a correct diagnosis at the time of physical examination is imperative while dealing with beef cattle to decrease stress and number of times the animal is required to go in the chute. Ancillary tests can be used to assist physical exam interpretations and facilitate proper treatment of the animal. Chute side diagnostics can decrease trips to the ranch and increase efficiency. Point-of-care diagnostics including blood tests and imaging modalities are readily available.

**Keywords:** bovine, chute side, point of care, diagnostics, ultrasound

## Physical exam

A systematic and thorough physical examination is the most important chute side diagnostic aide available to the bovine practitioner. After obtaining a complete history, the habitus, resting respiratory rate and body condition score (BCS) should be noted. The distance exam of neonatal calves includes observation of nursing behavior, urination, defecation, musculoskeletal abnormalities and resting respiratory rate. Hands-on examination includes auscultation of the heart, thorax and abdomen and a rectal temperature. Reference ranges for calves are as follows: RR (20-50 bpm); HR (90-112 bpm); rectal temp (101.4-103.4°F, 38.5-39.5°C). The ribs should be palpated for rib fractures and the umbilicus palpated. The eye exam can note congenital abnormalities, as well as recession to assess hydration status. A mouth exam and palpation of the limbs are included, as well. All of this gives a lot of information in a short amount of time.

The reference ranges in mature cattle are RR (12-36 bpm); HR (50-80 bpm); rectal temp (100.5-102.5°F, 38-39°C); rumen contractions should be auscultated and can also be palpable via rectal palpation and in the left paralumbar space (2-3 contractions in 2 minutes). A rectal examination and mouth examination are performed, as well as a withers pinch. The physical examination gives direction to what further diagnostics may be useful and comprehensive physical examination techniques have been previously discussed and should be reviewed.

## Bovine viral diarrhea virus (BVDV)

There are very few commercial point-of-care tests available to the beef cattle practitioner. The BVDV SNAP test has proven to be valuable in my practice for the pre-weaned respiratory disease calf that is still on its dam. If the calf is BVDV negative, then I will treat with appropriate antibiotics and have the owner test the rest of the calves in the herd and address mineral status. A positive test can be repeated in 3 weeks to confirm persistently infected (PI) status.

## Acute phase proteins and clotting factors

Fibrinogen is an acute phase protein produced in the liver that begins to increase in 2 days from inflammatory insult and reaches its peak in 10 days. It is a non-specific indicator of inflammation which can play a role with the physical exam to direct treatment.<sup>11</sup> Normal values range from 200–700 g/dl with some internists considering 400 g/dl and above significant. The “Coffee Cup Fibrinogen” test is a quick and simple way to estimate fibrinogen at the time of initial presentation and can also be useful in following trends:<sup>b, 11</sup>

### Instructions for Coffee Cup Fibrinogen

1. Fill 2 hematocrit tubes with lavender top EDTA whole blood.
2. Spin tubes and measure total protein of the plasma with a refractometer.
3. Incubate 2 of the tubes in a 57°C water bath for 3–5 minutes, then re-centrifuge and read plasma protein.
4. Subtract tube 2 protein from tube 1 protein for estimated fibrinogen concentration.
5. Each 0.1 g/dL is approximately 100 mg/dL fibrinogen.
6. Low = clot formation; Elevated = inflammation

Serum amyloid A (SAA) is another acute phase protein that rises in 24-48 hours from time of insult and decreases rapidly making it a useful parameter to monitor response to treatment.<sup>9</sup> There are commercially available point-of-care tests available for horses, but they do not work to assess cattle SAA.<sup>c,d</sup>

A “poor man’s clot test” can be done when wanting to assess clotting factors or septicemia. Whole blood can be put into a red top tube with no additives and then turned upside down on a stable flat surface and monitor that it starts to clot within 5 minutes.<sup>b</sup>

Packed cell volumes and total protein can be done easily and quickly and provide information on hydration and red blood cell status.

## Chemistry panels

Serum chemistry and electrolyte levels can be assessed chute side relatively easily with hand held chemistry analyzers, but the initial cost of purchase and upkeep may keep the average practice from investing. The VetScan VS2e is a counter chemistry analyzer that is durable enough to take in the ambulatory truck and use with converters. The rotors must stay refrigerated and come in packages of 12, 24 or 48 (depending on rotor type) from the distributor. Shelf life of the rotors are 9-18 months and the machines are easy to maintain.

The large animal rotor is recommended for cattle and contains values for ALB, ALP, AST, BUN, Ca, CK, GGT, GLOB, Mg, PHOS and TP. The large animal rotor is not calibrated for any species beside cattle, so my clinic stocks the Equine Profile Plus for

horse use and the Kidney Profile Plus and Mammalian Liver Profile for use in all other species including exotic hoof stock and small ruminants. These machines require a small amount of blood in a green top tube (lithium heparin). When filling blood tubes after collection, fill the green top tube, then lavender top and then the red top. This is to avoid potential contamination of EDTA causing falsely elevated sodium, potassium or calcium levels. It is also important to note that really high CK levels will falsely elevate potassium levels and that the machine will not work for samples with a PCV greater than 55 and is unreliable in moderate to severe lipemic samples.<sup>f</sup>

## Cytology and fluid analysis

Blood smears can be helpful to rule in *Anaplasma marginale*, perform white blood cell differentials and assess other blood disorders. The author has diagnosed juvenile lymphosarcoma in a 2-year-old periparturient beef master cow that presented for inappetence by looking at a blood smear that had many large lymphocytes that were easily recognized as abnormal.

Total protein of joint and peritoneal fluid is a simple and easy test along with visual analysis of fluid. Total protein of normal joint fluid is <2.5 g/dL and septic arthritis is >4.0 g/dL.<sup>8</sup> Peritoneal fluid should be <3.0 g/dL.

Rumen fluid can be assessed by making a wet mount on a slide and quickly ascertaining quantity and mixture of rumen bugs present. Evaluation is done by adding a drop of fluid to a warm microscope slide and at low power,  $\geq 40$  protozoa per field is adequate. The slide should look like a bustling city, with >10 entering the field in 30 seconds. Both ciliated (holotrichs) and flagellated (entodiniomorphids) protozoa should be present and moving. The proportions of these populations can vary based on the diet of the animal.<sup>3</sup>

Urine can be quickly analyzed with a urine strip or pH strips, and a clinical refractometer. I use these tests to decide whether the animal is at risk for urolithiasis. I also worry about kidney function when the urine is very dilute in a clinically dehydrated animal or animals with azotemia. Visual examination of color and odor may also lead a practitioner to decide to do a sediment exam or whether there is a need for a urinary culture in suspect pyelonephritis cases.

Urinary strips can be useful in the evaluation of cerebral spinal fluid as they detect weak concentrations of total protein. Normal protein content of CSF is 12-40 mg/dl and most of it is albumin.<sup>6</sup> Meningitis can be suspected as TP in CSF increases (>100-200 mg/dl).<sup>10</sup> This translates to 1+ (30mg/dl) being generally considered normal and >2+ (>100mg/dl) specific for increased protein. Increased protein is a non-specific indicator of pathology that can be attributed to disruptions in the blood brain barrier, intrathecal immunoglobulin production, or necrosis.<sup>7</sup>

CSF can also be examined physically by placing in a test tube and shaking it for 5 minutes. Normal protein levels within the CSF will have slight foam that disappears after a few minutes. Foam that remains for a longer period of time indicates increased protein levels.<sup>6</sup>

## Imaging

Digital imaging is the most valuable chute side diagnostic tool available in my practice, with ultrasound being the most readily available to the bovine practitioner. The limitations of ultrasound are that only structures adjacent to the body wall are visible and most abdominal organs are not entirely visible. The rectal probes (5-10 MHz) that most bovine practitioners have for reproductive use can be used to assess the surface of the lungs, look for peritonitis in the ventral abdomen, assess the liver and kidneys, as well as other soft tissue structures of the body including the eye and retrobulbar area. An excellent resource for ultrasonography is the *Veterinary Clinics of North America Food Animal Practice Series, Bovine Ultrasound*.<sup>1,4</sup>

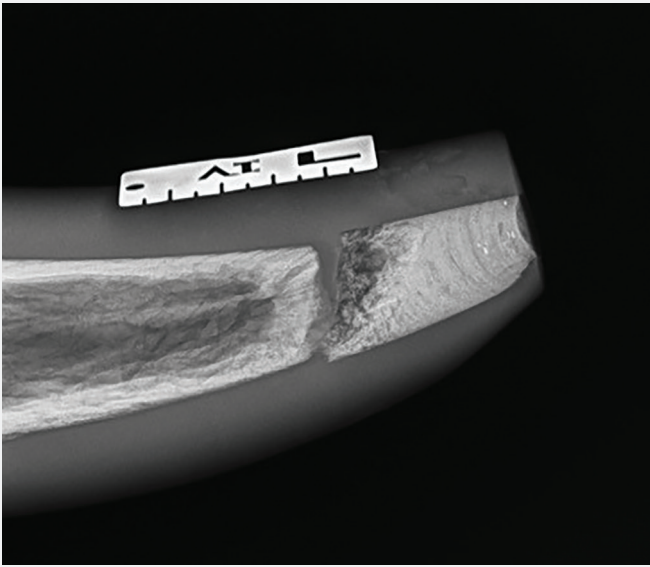
Most adult beef cattle are too big for abdominal radiography, but it can be useful in calves and small ruminants. A single dorsopalmar/dorsoplantar view of the foot can often help with diagnosis and prognosis in complicated foot lesions or in non-specific lameness involving the distal limb.

With the high proportion of horned cattle in my practice, I use radiography to assess horn health routinely. Bucking bulls are required to have their horns "tipped" leaving a blunt distal end of the horn to a minimum size of a 50-cent piece (2.5cm) for competition. It is best to avoid an open sinus to decrease the chance of fatal complications of meningitis and brain abscesses. In order to do this, radiographs can be taken with a metal marker placed on the horn and a cut can then be safely made distal to the sinus to avoid complications and promote faster healing (Figures 1 and 2). During our routine radiographs for tipping, many asymptomatic infected horns are identified as incidental findings with indications of sequestration as diagnosed by lytic areas distal to sinus (Figure 3).

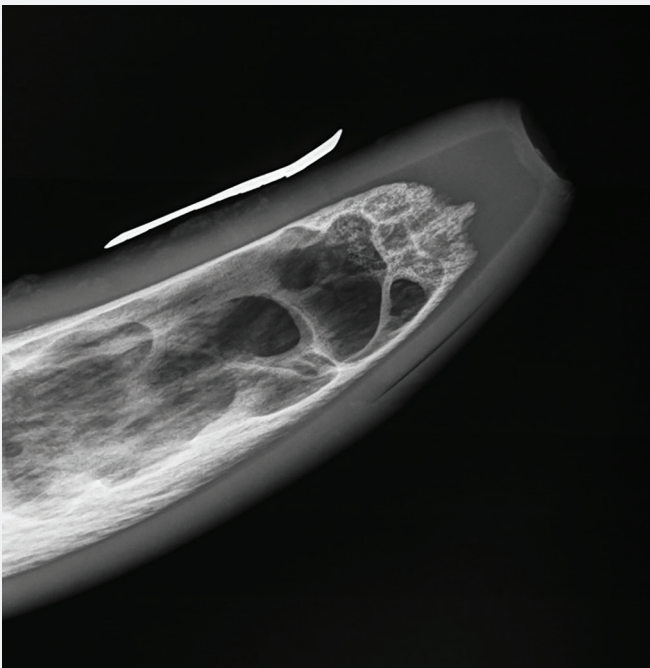
**Figure 1:** Radiographs can be taken with a metal marker placed on the horn and a cut can then be safely made distal to the sinus to avoid complications and promote faster healing.



**Figure 2:** Radiographs can be taken with a metal marker placed on the horn and a cut can then be safely made distal to the sinus to avoid complications and promote faster healing.



**Figure 3a:** Radiograph of a horn of a 7-year old bucking stock bull that presented for routine “tipping” of horns to comply with performance standards. The radiograph reveals a lytic area consistent with a cornual process of the frontal bone sequestration involving the entire apex.



**Figure 3b:** The apex of the horn (“tip”) appears healthy outwardly and the bull did not show any clinical signs.



**Figure 3c:** The metal marker is placed to determine where to cut the horn distal to healthy cornual sinus.



**Figure 3d:** The cut distal tip is pale and edematous with no odor.



**Figure 3e:** The surgical site is stimulated to bleed and kept bandaged until healed.



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