

PREGNANCY TESTING IN BEEF CATTLE

is a very important and useful management tool that producers can use to determine the pregnancy status of breeding females. Pregnancy determination will identify candidates (i.e., non pregnant or “open” cows) which should be culled, or removed from the herd, and sold. Timely detection and marketing of open cows can increase ranch profitability by allowing the producer to strategically market cows when prices are the most lucrative. Some methods of pregnancy detection can also provide additional information regarding the beef herd and help producers make informed management and business decisions. Timely marketing will save on feed, veterinarian and production costs. However, only 20 percent of United States beef operations use any form of pregnancy detection.

The use of pregnancy diagnosis ranges from 11 percent for small operations (1-49 head) to 72 percent for operations with 200 or more cows (USDA-NAHMS, 2009). Opting to keep non-productive cows, or cows that fail to produce a calf, decreases operation profitability. This is due to the high costs of maintaining a non-productive cow. The average cost of maintaining a cow in the Pacific

Pregnancy testing is also a tool that can be used to optimize heifer management, such as determining the breeding success of estrous synchronization and artificial insemination (A.I.) programs shortly after breeding has concluded. Heifers can then be kept or sold depending upon pregnancy status. They can also be grouped according to pregnancy stage for easier calving management. Information on pregnancy status can also be used to make improvements in heifer management for the next year. For example, if pregnancy rates are low, a producer might look at changes needed in bull selection, nutrition, animal health or breeding programs to improve pregnancy rates the following year.

Pregnancy testing can be most profitable when used at two different times during the year. The first would be a minimum of 30 days (dependent upon method used) after the breeding season ends. The second would be when calves are weaned and

before gestational feeding programs begin. Pregnancy testing at this time would ensure that only cows that are carrying a calf would be fed until calving.

Pregnancy detection at these key times offers several advantages:

- It gives early warning of breeding and/or reproductive problems, such as infertility in males, problem breeders in females and can alert producers to the possibility of disease, particularly trichomoniasis, in the herd.
- It serves as a decision tool to determine if females should be rebred or sold as non-pregnant females.
- It allows for timely marketing of open cows.
- It allows for separation and grouping of females as pregnant (and stage of gestation in some cases), and non-pregnant, which provides opportunity for proper management regarding nutrition, health, late calving cows and culling.
- Late calving cows can be discovered through specified pregnancy checking methods and separated from the main herd or sold to improve uniformity of calf crops.
- It makes it possible to guarantee open cows and pregnancy status of females according to the date of last pregnancy checking that are for sale.
- Information from pregnancy diagnosis, such as pregnancy status, stage and fetal gender can be utilized for marketing purposes.

Pregnancy detection is most often conducted by trained veterinarians and technicians. However, some pregnancy detection methods are relatively easy to learn and can be utilized by producers. As new technologies emerge for pregnancy diagnosis in cattle and ranching input costs continue to rise, more producers may consider pregnancy checking their own cows as an option. Developing pregnancy testing skills is also advantageous as the number of large animal veterinarians continues to decrease and scheduling ranch visits becomes more difficult. The option of not utilizing pregnancy testing methods can be expensive, provides the operator with fewer marketing options and provides little to no reproductive information regarding your herd. In most states, pregnancy diagnosis for a fee, or of cattle owned by others, is restricted to licensed veterinarians or

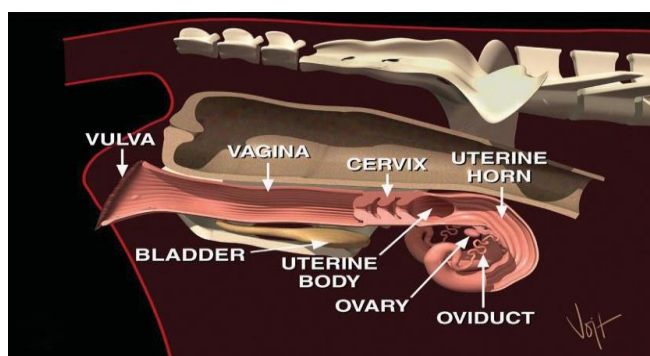
veterinary technicians. In some states, individuals can work in cooperation with a licensed veterinarian to conduct pregnancy detection for other producers. It is important to know the laws of your state regarding these practices.

The three available pregnancy detection methods are rectal palpation, ultrasound and biochemical tests and are described in the following paragraphs.

Rectal palpation

Pregnancy is routinely detected in cows by inserting the hand into the rectum and palpating through the rectal and uterine walls for a fetus, which can be detected during the latter first and second trimester of gestation. A palpator may also detect signs of pregnancy which include fetal membranes, the amniotic vesicle and/or cotyledons, commonly referred to as "buttons," within the uterus. Training for pregnancy detection by rectal palpation involves taking a course on pregnancy diagnosis or working with an experienced palpator. Palpation generally requires practicing on thousands of animals to become proficient in determining pregnancy status and in detecting other existing reproductive health conditions.

Accuracy in pregnancy testing depends upon the ability to recognize changes in the tone, size and location of the uterine horns as well as changes in the uterine arteries. Fetal size and characteristics used in determining pregnancy are given in Table 1. A well-trained palpator can detect pregnancy 35 days after insemination. Accuracy at 30 days post breeding or less is reduced and a second examination is often required. The highest accuracy is achieved at 45-120 days of gestation. Experienced palpators can achieve 95-99 percent accuracy when testing during this stage of gestation. Fetal age can also be determined during this time period.



In addition to pregnancy detection, experienced, knowledgeable palpators can determine if reproductive problems or other conditions exist in open cows. Palpation can help determine cyclic status, presence of ovarian cysts, uterine infections and the presence of uterine adhesions. This method provides good information regarding days pregnant and calving dates. Rectal palpation generally costs \$3-5 per head plus any off-site visit fees when conducted by a veterinarian or technician. Rectal palpation methodology

Rectal palpation for pregnancy diagnosis should not be attempted by untrained individuals. The proper steps involved in rectal palpation (Figure 1) are outlined in the following steps:



Figure 1. Rectal palpation method used to determine pregnancy status. Photo by John Hall.

1. A veterinary-grade plastic sleeve should be worn. Palpation is normally done with the left arm regardless of your dominant hand due to the position of the rumen on the left side. Some palpators prefer to place a veterinary-grade latex glove over the sleeve. It is helpful to secure the plastic sleeve to your clothing to ensure the sleeve is positioned properly and does not slip. A pair of forceps, clips, or rubber bands work well.
2. Apply obstetrical lubricant to the sleeve for the first palpation.
3. Carefully and gently insert the hand and arm into the rectum. Maintain firm but gentle contact with the rectal floor. Experienced palpators will be able to identify the cervix, uterus, ovarian and pregnancy structures (Figures 2-4). Palpators must find a positive sign of pregnancy to diagnose a cow as pregnant. The only positive signs of

pregnancy in the cow are a fetus, the mid-uterine artery, placentomes (cotyledons and caruncles), the amniotic vesicle and fetal membrane slip.

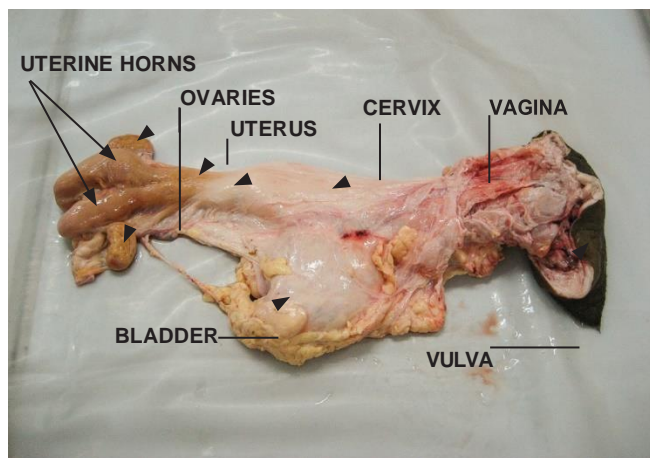


Figure 2. Female beef reproductive tract. Photo by Scott Jensen.

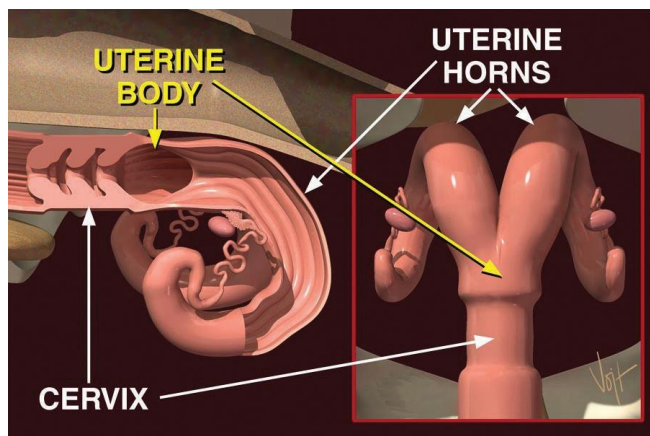


Figure 3. Diagram of the female beef uterus. Courtesy of Select Sires, Inc., Plain City, Ohio.

Figure 4. Diagram of the female beef reproductive tract. Courtesy of Select Sires, Inc., Plain City, Ohio.

4. In most cases, it is not necessary to change sleeves and gloves for each cow. However, if blood or other discharge is discovered in a cow, change the sleeve immediately before palpating additional cows. Some diseases, such as anaplasmosis and lymphoma, among others, can be transmitted via rectal palpation. In herds with these diseases, a new plastic sleeve should be used for each cow. To promote good herd health and management practices, consider changing sleeves periodically to reduce the incidence of spreading disease. Also, replace sleeves that become torn.

5. Most producers choose to mark the cow on the hips with chalk or bleach to aid in sorting cows following pregnancy checking. For example, a straight mark on both sides of the hip can be used for pregnant cows while an "O" can be used to designate open cows.

6. Record information on animal identification and pregnancy status and summarize on record sheets of your choosing.

Key Points

If rectal palpation is the method selected for your cows, a few key points should be followed.

- First, cows should be worked quietly and kept calm to avoid potential pregnancy loss. Follow cattle handling procedures as recommended by your state's Beef Quality Assurance Guidelines.
- Second, cows should be properly restrained to prevent injury to the handler, the cow and fetus.
- Third, internal body tissues are delicate and subject to tears or additional damage by the palpator. Always be gentle when entering the rectal cavity and palpating the uterine environment. Care should be used with finger positioning and movement. Fingernails should be clipped short to avoid tearing tissue. In addition, rough rectal palpation prior to day 45 of pregnancy can cause damage to the developing embryo and even pregnancy loss.

Ultrasound

Real-time ultrasound has become the method of choice for early pregnancy diagnosis by many veterinarians and some producers. With this method, an ultrasound transducer is inserted in the rectum of the cow and an image reproductive structures, the fetus and fetal membranes is obtained on an attached screen or monitor (Figures 5–6). Two types of transducers are available for use in cattle. There is a linear probe which is inserted in the rectum of the cow with your arm. Convex probes are also available which allow the ultrasounder the capability to achieve more detail and image

depths. Convex probes can be utilized in extension arm ultrasound probes (Figure 7). These probes eliminate the need to insert a hand or arm into the rectum. This type of probe allows the individual to determine pregnancy status on more animals as the arm will not tire as quickly as with insertion type probes. One must utilize caution with any of these probes as sudden movements or a rough, forceful technique can cause rectal tears.

Compared to rectal palpation, pregnancy determination by ultrasound is relatively easy to learn. Several commercial cattlemen's schools offer ultrasound training. Contact your Extension educator or specialist to find where and when ultrasound training is offered in your area. Most people can learn to accurately detect pregnancies at 45 days post conception in only a few training sessions.

Learning to identify the non-pregnant reproductive tract is the most challenging. Experienced operators can detect pregnancies as early as 25 days post breeding with accuracies up to 85 percent, and with higher levels of accuracy (> 96 percent) at 30 days of gestation.

In addition to pregnancy detection, ultrasound examination provides the producer with excellent information. This technology can determine the viability of the fetus, presence of multiple embryos, fetal age, calving date and occasionally fetal defects. Experienced ultrasound technicians can determine fetal sex when ultrasound is performed at 55 to 80 days gestation. Information on reproductive health or other health problems with open cows can also be assessed.

Only real-time ultrasound equipment specifically designed for veterinary applications should be purchased and utilized for your operation. These units are portable, rugged and often battery powered. Some units may require an electrical source. Ultrasound equipment ranges in cost from \$7,000 to \$14,000. Due to the high purchase costs of this equipment, veterinarians tend to be the primary purchasers. However, several large ranches may consider purchasing units jointly, given that using ultrasound units on several thousand animals a year greatly reduces costs

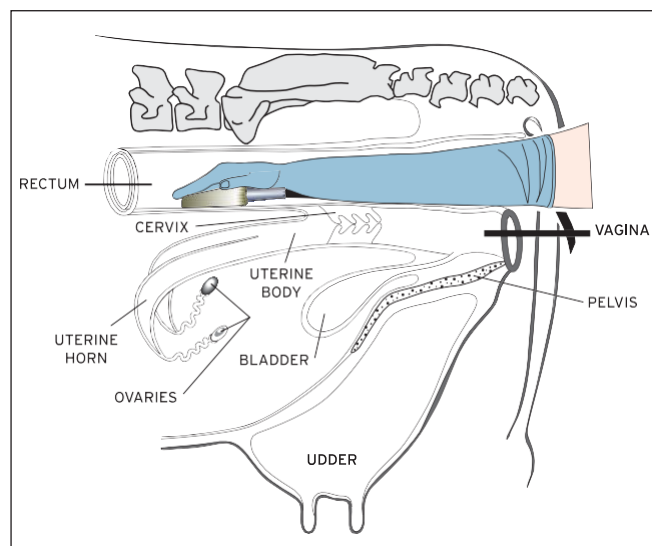


Figure 5. Transrectal Ultrasonography with Easi-Scan courtesy of BCF Technology.



Figure 6. Ultrasound machine used to determine pregnancy status. Photo by Danielle Gunn.



Figure 7. ReproScan XTC with extension arm probe. Courtesy of Andrew Bronson, DVM, ReproScan.

per cow. In many cases, the cost of the unit can

be recovered in a few years versus paying for professionals to conduct a field call and pregnancy checking several hundred head of cattle. Ultrasound examination provides the producer with the most marketing information of any technique used. Most veterinarians and/or technicians charge approximately \$3 to \$10 per head for ultrasounding and may charge an off-site visit fee. If fetal age and sex determination are requested, the ultrasound fees will increase.

Ultrasound methodology

Ultrasound imaging for pregnancy diagnosis should not be attempted by untrained individuals. Individuals who choose to conduct ultrasound as a pregnancy checking method should follow these steps:

1. Charge equipment battery and have an extra charged battery on hand before beginning.
2. Equipment should be set up and screen adjusted to optimize the image and improve reading accuracy. Direct sunlight can make screen interpretation difficult so it is often necessary to place a temporary structure, such as a tarp, over the screen to aid in reading results if facilities are outdoors and uncovered.
3. A veterinary-grade plastic sleeve should be worn. Ultrasound is normally done with the left arm as described in the palpation section.
4. A veterinary-grade latex glove can be fitted over the sleeved arm. It is helpful to fasten the plastic sleeve to your clothing to ensure the sleeve is positioned and secured properly. A pair of forceps, clips or rubber bands work well.
5. Apply obstetrical lubricant to the probe for each palpation. The lubricant helps obtain an accurate picture on the screen and aids in insertion into the cow.
6. Gently insert your hand and transducer in the rectum. Once inside the rectum, apply firm, but gentle pressure on the rectal floor. A slow, gentle sweeping motion from side to side will help you obtain pictures of the uterine environment, reproductive structures and pregnancies.
7. In most cases, it is not necessary to change sleeves and gloves for each cow. However, if blood or other discharge is discovered in a

cow, change the sleeve immediately before ultrasounding additional cows. Some diseases, such as anaplasmosis and lymphoma, among others, can be transmitted via fluids on the sleeves and probe. When ultrasounding herds with these diseases, sleeves should be changed for each cow and the probe should be cleaned with a mild disinfectant and rinsed with water between each cow. To promote good herd health and management practices, consider changing sleeves periodically to reduce the incidence of spreading disease. Change sleeves that become torn immediately.

8. Most producers choose to mark the cow on the hips with chalk or bleach to aid in sorting cows following pregnancy checking. For example, a straight mark on both sides of the hip can be used for pregnant cows while an "O" can be used to designate open cows.
9. Record information on animal identification and pregnancy status and summarize on record sheets of your choosing.

Key points

If ultrasound is the method selected for your cows, a few key points should be followed.

- First, cows should be worked quietly and kept calm to avoid potential pregnancy loss. Follow cattle handling procedures as recommended by your states Beef Quality Assurance Guidelines.
- Second, cows should be properly restrained to prevent injury to the handler, damage to the ultrasound machine and probe, and injury to the cow and fetus. Care should be used when handling the ultrasound machine and probe. Striking the probe against a hard object such as a chute or dropping the probe on a hard surface can damage and even crack the ultrasound probe. Good ultrasound images cannot be obtained with damaged probes and probes cost thousands of dollars to repair or replace.
- Third, internal body tissues are delicate and subject to tears or additional damage by the ultrasound technician. Always be gentle when entering the rectal cavity and obtaining images of the uterine environment. Care should be used with probe positioning and movement.
- Fourth, many ultrasound machines are now battery operated. It is a good idea to have an extra, fully-charged battery

available while pregnancy checking.

Ultrasound technology with extension arm probes

Ultrasound transducers can also be inserted into extension arm probes (Figure 7). Extension arm probes eliminate the need to place one's arm in the rectum. They are safe, effective and easy to use. In addition, 60- to 150-day pregnancies are easily detected with a convex probe used in an extension

quadrant of the abdomen. It may be necessary to lift up firmly on the handle and rotate the probe from one side of the uterus to the other to locate these advanced pregnancies. Remember that the pregnant uterus will generally be located to the right of the rumen. To improve accuracy, move the probe so it is over the right edge of the pelvis. Lift up on the handle of the extension arm probe while pressing down on the extension arm at the anus of the cow (Bronson, personal communication). This technique will push the ultrasound probe over the

brim of the pelvis, enabling you to find the advanced pregnancy. Figures 8–13 depict pregnancies and uterine structures. arm. To use ultrasound technology with an extension arm and convex probe, insert the probe into the extension arm and lubricate the extension arm. Then use the right arm to gently insert the probe into the rectum. Light pressure should be applied on the probe to maintain contact with the rectal floor and obtain a good image of the uterine environment.

With extension arm ultrasound, it can be difficult to detect pregnancies six months along and further.

This is because the fetus is deep in the cow and the weight of the fetus pulls the uterus over the pelvis. At this stage, the pregnancy is not always easily detected with the extension arm probe and one might call the cow open when in fact, she is pregnant. In addition, deep-bodied cows, older cows, dry manure, full rumens and large, obese cattle can make pregnancy detection at six months and older even more difficult with the extension arm. Different techniques are required to detect these advanced pregnancies.

The extension arm should be inserted all the way to the handle in large cows with advanced pregnancies. The extension arm can then be worked down onto the pregnancy which is most often in the right lower

Biochemical tests

In recent years blood tests using biochemical detection have become a practical alternative to ultrasound and palpation. These tests rely upon a change in the secretion pattern of a hormone or detection of a specific protein in the maternal system when an

embryo is present in the uterus. Biochemical tests are useful to determine what animals conceived to A.I.

in synchronization programs or to clean up bulls any time after 30 days post breeding. It is an easy, cost effective method to determine pregnancy status.

Biochemical tests can only determine pregnancy status. These methods do not have the capability to determine sex or gestational age of the fetus. This is a very easy method for a producer to incorporate into the herd management program. However, test results may take up to a week so information is not available immediately to determine culling and management strategies.

Pregnancy-Associated Glycoproteins (PAGs)

The placenta of the developing calf produces proteins that are secreted and appear in the maternal circulatory system. These proteins can be detected at approximately 25 to 30 days after breeding. Pregnancy-associated glycoproteins will remain in the cow's system and can be detected for up to 60 days after calving. Therefore, cows need to be at least 60 to 90 days postpartum to ensure an accurate reading. In practice, blood samples to detect pregnancy in beef cows are usually taken from cows that are more than 80 days postpartum. Measuring these proteins is an accurate way to determine pregnancy in cows.

Currently, three companies offer PAG tests in cattle. Each PAG tests for a different protein existing in the maternal system:

Accuracy varies slightly for each test, but research indicates accuracy of 93 to 99 percent compared to palpation or ultrasound. If used early (less than 35 days) in pregnancy, these tests might give more "false" positives due to possible lost embryos that were established, but died early in pregnancy.

Progesterone tests

The steroid hormone progesterone is secreted

by the corpus luteum into the blood or milk at different rates depending upon the day of the heat cycle. It is elevated during most of the cycle and low at time of heat. If a cow conceives, progesterone remains high until the end of pregnancy and is required at this level to maintain the pregnancy. If a cow is bred and does not conceive, progesterone declines as usual at the end of the cycle when heat occurs.

Blood or milk progesterone test kits can be purchased to analyze progesterone concentrations. To use these kits, a single blood or milk sample is collected at 21 to 24 days after breeding and analyzed. If progesterone is low, the cow is designated “not pregnant.” If progesterone is high, she is designated “pregnant.” The reason is that if the cow has not conceived, she will have lost her corpus luteum at testing time and progesterone production will be low. The cow may have just been in heat or coming in heat soon if progesterone concentrations are low. Progesterone remains high if conception occurs.

Accuracy of determining a cow to be “not pregnant” (low progesterone) is almost 100 percent. Even if a cow was pregnant, she would abort with a low progesterone testing level. Accuracy of determining a cow “pregnant” (high progesterone) is less than 85 percent. In this case, progesterone may be high at the time of testing because certain cows have shorter or longer estrous cycles or an embryo is present, resulting in high progesterone production.

However, if an embryo dies just prior to or shortly after testing, the test may inaccurately designate the cow as pregnant. Therefore, embryo loss contributes to the inaccuracy of progesterone for identifying “pregnant” cows. Early embryonic loss in beef herds can average 2 to 3 percent every year.

The lack of accuracy combined with the necessity to take the sample at a specific day post breeding makes progesterone tests problematic for pregnancy detection in commercial beef operations. Therefore, progesterone testing is limited in its use in the beef industry and may be more effective in dairy cattle when obtaining milk samples for testing.

Biochemical test methodology

Biochemical tests are conducted by drawing

blood from the coccygeal vein in the tail or the jugular vein in the neck. A minimum of 2 mL of blood must be obtained from each female. Needles must be changed for each cow to prevent crosscontamination.

Vacutainers used to collect the blood sample should be labeled according to the female’s identification number and kept cool during the collection event and before and during the shipment to a laboratory. Each laboratory will have a set of instructions you must follow for blood collection and shipping instructions. Many laboratories will send you the necessary equipment with a detailed set of instructions. You may also obtain sample instructions online or through wholesale animal supply companies.

Biochemical tests have a turnaround time of seven days or less. Some companies have a same day test available. Turnaround times may also be impacted by availability of mailing services and distances. Blood samples should be overnighted to the laboratory.

They cannot be used to determine fetal sex or age, and cows cannot be sorted until tests results are obtained. At the time of this publication, chute-side tests are not available but may be a possibility in the future.

Have an individual trained in bovine blood collection assist you when first learning how to collect blood.

Achieving optimum success

Regardless of the method you select, a few key factors should be followed to ensure testing accuracy.

- It is very important to keep animals calm to avoid potential pregnancy loss. Cattle should be handled with care, particularly when utilizing rectal palpation and ultrasound to avoid rectal tears, any other tissue damage and/or embryonic loss.
- Obtain adequate training for the method you select or locate a reputable veterinarian or technician to perform pregnancy testing.
- Follow your state’s Beef Quality Assurance guidelines.
- Record and maintain accurate records so testing efforts and results can be utilized in making optimum herd management decisions.