

New Technologies in Pregnancy Diagnosis

When I was veterinary student finishing my studies, one of our professors told us in ten years veterinarians would no longer need to palpate cows for pregnancy diagnosis. Fast forward, ten years later, our primary method of pregnancy diagnosis has not changed. However, with recent advancements in diagnostic technology and increasing availability of alternative pregnancy diagnosis options, change is rapidly approaching. Not all diagnostic tests are created equal, and it is important to understand the benefits and limitations of each test.

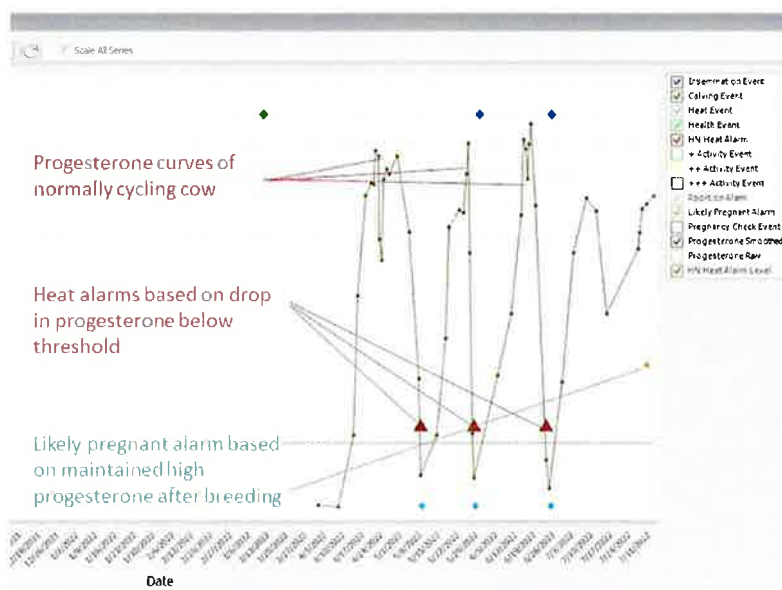
Rectal ultrasound

Still considered the gold standard in pregnancy diagnosis. Rectal ultrasound is usually the method used to validate the accuracy of other pregnancy tests in scientific studies. There are many more useful applications to ultrasonography beyond simple pregnancy diagnosis. With an ultrasound a skilled user can accurately identify ovarian structures to determine the best intervention such as which synchronization program to use or whether or not she is eligible for prostaglandin. This is determined mainly by identifying the presence or absence of a corpus luteum or "CL", which is the ovarian structure needed to produce progesterone in normally cycling cows. The ultrasound is currently the method we use to check fresh cows to look for endometritis or "dirty cows", both to treat and evaluate the transition program. The ultrasound, in combination with manual palpation, is currently the only way to identify structural abnormalities with the reproductive tract and fetal abnormalities during development. In addition, rectal ultrasound is also used to age fetuses with an unknown conception date, confirm abortion, detect twins, and determine fetal sex. To be used most effectively, rectal ultrasound needs to be performed by someone with sufficient training and practice.

Milk progesterone testing

As mentioned previously, a cow's CL is responsible for the regular progesterone curves in cycling cows. The CL is typically present at day five in a cow's (or heifer's) estrus cycle and begins to regress around day 17. Therefore, cows will have high blood levels of progesterone in the middle of the cycle and low levels at the beginning and end of the cycle. High levels of progesterone are needed to promote follicular recruitment and growth, but low levels are required for heat expression and a fertile ovulation. A cow that cannot produce sufficient progesterone, cannot get pregnant without intervention. Progesterone is also needed to maintain pregnancy during the length of gestation. Because the role of progesterone is so dynamic, a single test for blood or milk levels still does not give a clear picture of what is going on. This is why software combined with milk line sampling for progesterone testing was developed by a certain milking equipment company. This system takes sequential milk samples at regular intervals and tests the milk for progesterone which reflects the level of progesterone in the blood. This data is then used to determine where a cow is in her cycle, whether or not she is pregnant, if she has had an early abortion, and even if she is anovular or suspected for having endometritis. When used in combination with visual heat detection or activity monitors this can be a very effective heat detection tool.

The image below is a screen shot showing the programs data for an individual cow.



I work with two herds that use this system and it has been very interesting to see how the data shows variations between cows, variations from one cycle to the next in the same cow, and the weird and wacky things that happen with some cows that we otherwise would not know about. The reproductive portion of herd health visits focus more on evaluating the data to determine the best reproductive protocols and interventions. Palpations are still required to be done for replacement heifers and a few cows whose progesterone curves just don't make sense.

The system is limited in early endometritis detection because it needs time to collect sufficient progesterone data to call her dirty (which could be detected much sooner with ultrasound). In addition, this system is relatively expensive to install and operate and a high level of reproductive performance must be maintained to justify the cost. However, I can see this technology becoming more mainstream in the future.

Pregnancy associated glycoproteins (PAGs)

Whereas progesterone testing requires a history of multiple samples to determine pregnancy, PAGs can diagnose pregnancy with a single test. As the name implies, PAGs are glycoproteins released into the blood from the placenta of pregnant animals. PAGs can be measured in either milk or blood but the milk test is less accurate and does not always result in a definitive diagnosis, as about 3% of the milk tests are inconclusive. Over the past few years PAG testing has been available by milk through DHI or by collecting blood samples and sending to an external lab. As you can imagine, this can result in significant lag time to come to a diagnosis and make a plan for the open cows. More recently, cow side PAG tests using blood have become available for on-farm use. This test is easy to use and relatively inexpensive if there are only a few cows to check.

PAG testing does have its limitations. It cannot detect reproductive abnormalities, twins, endometritis, stage of cycle, anovular cows or fetal viability. PAG testing has a limited ability to confirm abortions in a timely manner since it takes about 7-14 days after abortion for blood PAGs to return to non-pregnant levels. Testing for PAGs will only tell you if the animal is pregnant or open. It will not indicate what you should do for your cows checked open.

No matter which tests you use, we recommend performing a recheck to account for normal early pregnancy loss.

The following table summarizes the abilities of the different pregnancy tests. Please note that all the studies I gathered the accuracy data from used rectal ultrasound as the confirmatory test. No diagnostic test is 100% accurate, although an ultrasound in skilled hands should be pretty darn close.

Sensitivity = the proportion of truly pregnant cows that test positive for being pregnant

Specificity = the proportion of truly open cows that test negative for being pregnant

	Ultrasound	PAG	Progesterone
Days bred when you can reliably test	28 d	28 d	>30 d, continue to test for 25 d after preg
Timely detection of abortion	yes	no	yes
Stage of cycle	yes	no	yes
Anovular cows	yes	no	yes
Fresh check	yes, 21-28d fresh	no	Yes, but not until >50d fresh
Twin diagnosis	Yes	no	no
Fetal sexing	yes	no	no
Fetal viability	Yes	no	no
Sensitivity (relative to ultrasound)	100%	blood =99.1-99.7% milk = 98.7%	96%
Specificity (relative to ultrasound)	100%	blood =95.1-98.1% milk = 94.4%	90% <40days bred 94% >40days bred

We have seen our herds make advancements in their reproductive performance through regular herd health visits, improved timed artificial insemination protocols, strategic culling, and gaining a better understanding of transition cow management and nutrition. Optimal dairy herd reproductive performance is essential for the profitability of a dairy operation and our knowledge and the technology in this field continues to develop. As always, your herd veterinarian is there to help you with any inquiries you may have on new trends in reproduction. Our team at Heartland strives to critically assess and work with new ideas and technologies that will help our clients. It will be interesting to see what dairy reproductive medicine will look like over the next 10 years.

Stay tuned

Thomas Veens

Fly Control

Have you heard the buzz? Large animal technicians are now offering fly prevention in combination with dehorning services. Ask your large animal tech for more information!



Upcoming stat holidays

The clinic will be closed Labour Day Weekend, September 3-5th. As always, veterinarians will be available 24-7 for emergency service. The Saturday fee schedule will remain unchanged from non-stat weekends.