'Round-the-Clock Heat Detection

Producers who use the HeatWatch® system report improving AI conception rates while reducing time and labor devoted to heat detection.

BY ANGIE STUMP DENTON

The bottom line for most producers is getting their females bred, whether artificially or naturally. Using the HeatWatch® system, Bonnie Sivage of Sivage Angus, Hays, S.D., has seen her number of females settled by artificial insemination (AI) increase fourfold.

Sivage, who has been artificially inseminating her registered and commercial Angus herds for more than 20 years, says using HeatWatch decreases the human error of heat detection, making it more objective rather than subjective. "It is the most positive step I've taken in helping make our AI program successful."

Using the system Sivage says you don't miss the prime time to inseminate a cow. "Heat detection is the key to AI, not the technician," she says.

Time and labor are two of the biggest management obstacles facing farmers and ranchers today, especially those with off-farm jobs or multifaceted operations.

Proper heat detection requires time and observation says Jack Whittier, Colorado State University Extension beef specialist. The time and labor required for checking heat often makes it difficult, expensive or inaccurate. Incomplete detection will reduce the effectiveness of an AI program.

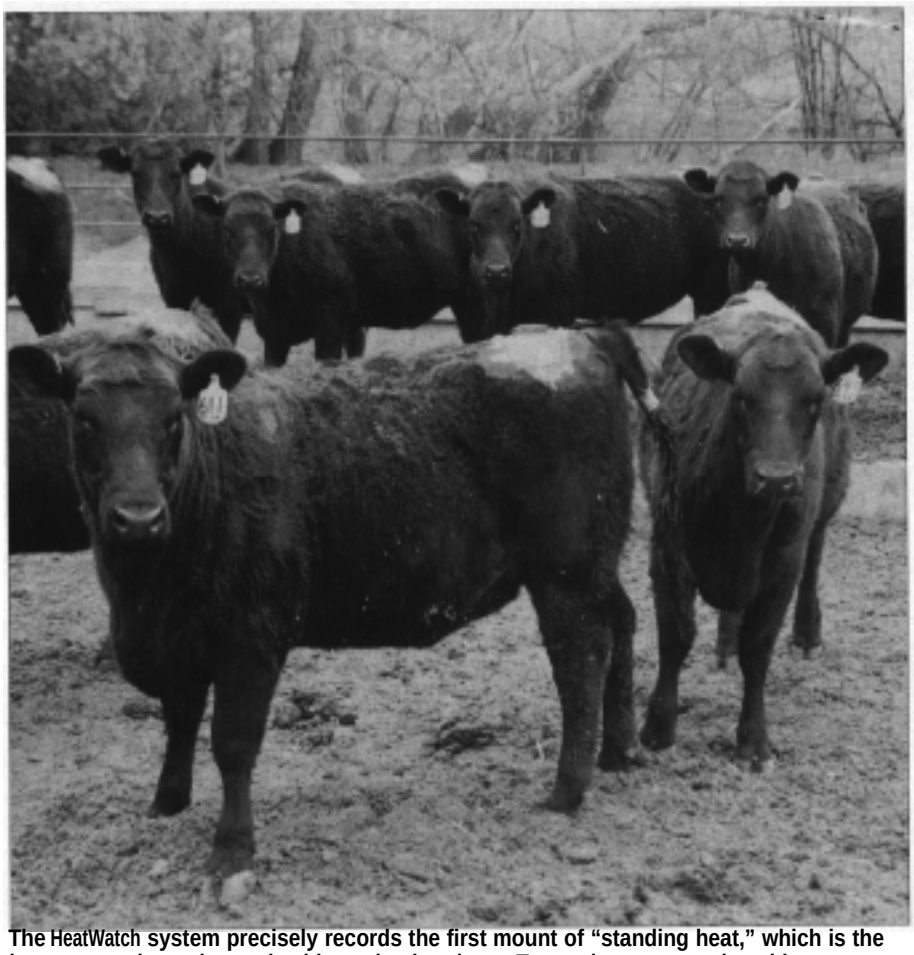
Over the years, numerous methods of detecting estrus have been used, including: modified males or females with or without chin-ball or chest markers, pressure-sensitive dye capsules, grease sticks, latex paint and periodic visual observation.

In the early '90s Tim Starzl, founder of DDx Inc., wanted to solve one of the beef industry's most costly problems for operations using AI — missed breeding due to nondetected heat. Realizing the fact cows express heat by allowing other cows to mount them and with a strong working knowledge of radio frequency technology, Starzl put together the original development team to construct HeatWatch.

The original concept was redesigned three times before the first commercial product was introduced in April 1994.

Use of the system significantly increases heat detection rates with corresponding improvement in pregnancy rates and reduced breeding expenses, explains Heather Watts, HeatWatch marketing manager. "HeatWatch has been shown to detect up to 95% of all standing mounts," that feature, she says, allows users to see several benefits:

1. The system provides 24-hours-a-day, seven-days-a-week heat detection;
2. On average, beef operations spend more than two hours a day on visual heat detection during the breeding season. With HeatWatch no visual detection is needed, so the average operation can save 180-225 man-hours per breeding season;
3. Using HeatWatch an operation can eliminate the use of costly synchronization drugs while increasing AI conception rates;
4. For operations performing embryo transfer (ET), HeatWatch can save the operation valuable money properly detecting recipient females' heat cycles;
5. Increased management efficiency can save thousands of dollars on feed and reduced labor;
6. Improved AI conception rates reduce the number of repeat breedings, improving semen cost management and decreasing the utilization of cleanup bulls; and
7. The system helps identity problem cows early.



The HeatWatch system precisely records the first mount of "standing heat," which is the best way to determine optimal insemination times. Transmitters are enclosed in orange pouches and are placed in front of the base of the tail and between the hooks and pins.

Who uses the program?

Originally the system was intended for the dairy industry, but a growing number of beef herds are incorporating it into their management plans. Watts says the size of operations that use the system vary from less than 20 head to 10,000. She says all sizes of operations can benefit from the system — smaller farmers who could be hobby ranchers don't have the time or resources to perform visual heat detection; medium-sized ranchers often grow crops, so the time they save using HeatWatch they can devote to farming; and large producers, she says, who are usually the ones most interested in improving the genetics in their herd, can spend more money on expensive semen because they know the exact onset of estrus, thus lowering the risk in missing optimum breeding times.

Angus breeder Howard Hillman, Canova, S.D., agrees the HeatWatch system is a necessary tool for a successful AI program. This will be the third year Hillman has used the system on Bon-View Farms' 400 head of breeding-age females.

"Using the system has freed up the key people who normally visually heat detect. It helps sort out problem cows and helps us get more cows settled to AI bulls," he adds.

Using the heat detection system, Hillman no longer synchronizes his heifers. "We feel we have bunched them up equally as well with the system," he explains.

Larry Huffman of Mexico, Mo., was disappointed in the conception rates his smaller Angus herd was experiencing, so he contacted Hillman about his success using the HeatWatch system.

"Howard convinced us about the system," Huffman says. Using the system last year Huffman increased his AI conception rates from 50% to 90%.

"The biggest benefit of the system is you don't have to spend time sitting in pastures," he explains. "You just go to the computer and know what's going on."

How it works

HeatWatch uses radio frequency data communication (RFDC) technology. A miniaturized radio transmitter powered by a replaceable lithium battery is put inside a disposable fabric patch and glued onto the tailhead of the cow.

When the cow is mounted, the transmitter sends a radio signal containing data about the particular mount to a buffer, which is hard-wired to the breeder's personal computer. The computer stores all incoming mounting information until the breeder accesses the HeatWatch software. At that point, data is uploaded and activity reports are generated. From these reports, breeders can determine the likelihood of each cow being in heat.

HeatWatch DOS software separates the cows into five lists, or reports, based on mounting activity:

1. Standing heat — the default setting is at least three mounts during four hours;
2. Suspect heat — those that don't qualify for the standing heat list but have been mounted
3. Nonreturn — cows that have not returned to heat after 25 days;
4. Inactive — cows on the system for 25 days that have not been mounted; and
5. Brief cycle — cows returning to heat less than 13 days since their last known heat.

The new Windows® version (soon to be released) has the ability to create an unlimited number of customized lists and reports based on the parameters the producer wants to track or measure. One HeatWatch system can simultaneously monitor up to 8,000 animals.

HEATWATCH EQUIPMENT

TRANSMITTERs are small (3x2x0.5-inch), reusable, battery-powered digital radio frequency units containing a pressure sensor for detecting mounting activity and transmitting this data to the receiver. Upon use, each transmitter is enclosed in a fabric patch for application to the tailhead of a cow. Some system owners also attach a 1x12-in. strap that is secured to the tail with tape to serve as a safety strap,

A transmitter can transmit a mounting activity signal more than a quarter mile (0.4 km) in line-of-sight to the receiver. Transmission occurs 40 times during a 40-second period to ensure signal receipt of mount data. Periodically, a supervisory signal is sent from the transmitter to the receiver as confirmation that the transmitter is working properly. Should a transmitter not send a supervisory signal, as in the case of a dead or dying battery, owners are alerted by the HeatWatch system.

The RECEIVER is a sophisticated electronic device that receives mounting activity information from the transmitters on the cows in the form of radio frequency signals. The receiver is encased in a weather-resistant enclosure designed to be installed on a stationary post in a field. The receiver may be up to 500 feet away from the HeatWatch buffer. The mounting activity information captured by the receiver is stored in the buffer connected to the computer.

The BUFFER receives mounting activity information from the receiver and passes the information to the computer. The buffer can exchange data with the computer almost instantaneously, and may also be used to store information until you are ready to use it. The buffer is capable of storing 2,500 mounts.

REPEATERS are necessary for situations when the operation is large or unusually spread out. The standard HeatWatch System has a range of 1/4 mile, A repeater will extend the range directionally by a 1/2 mile. Repeaters allow the HeatWatch System to cover areas obstructed by structures or irregular terrain.

The HeatWatch SOFTWARE component records and organizes the transmitted signals so that the time of day and duration of each mounting event is recorded and tabulated for each animal.

The minimum computer requirements for DOS operating systems include:
Operating system — DOS 6.20 or higher
Processor — 386 megahertz or higher
Conventional memory -At least 570K
Hard disk space — At least 2 megabytes (MB) free
RAM -At least 2 MB
Communications port — One available serial port

The minimum computer requirements for Windows operating systems include:
Operating system -Windows 95®
Processor — Pentium
Hard disk space -At least 20 MB free
RAM -At least 8 MB
Communications port — One available serial port

Use in research

Watts says currently more than 40 universities are using the HeatWatch system in research or other projects.

Ray Nebel, Virginia Tech dairy science professor, has used the system in his research investigating the optimal time of insemination. Through his research evaluating 2,600 dairy cows from 17 herds, he found the characteristics of estrus to be highly variable and not significantly different across herds. He also found the onset of estrus is equally distributed throughout the day. Although his research has focused on dairy cattle, he says the main differences between a beef and a dairy cow would be that the average beef cow is in heat longer and would be more sexually active than the average dairy cow.

According to Nebel, estrus is determined hormonally and how a heifer or cow displays estrus depends on her environment. "One of the biggest challenges related to estrous detection is the variances of cycle characteristics among cows," Nebel says. "Estrous cycles can be broken into four

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categories — low intensity, short duration; low intensity, long duration; high intensity, short duration; and high intensity, long duration."

Historically producers would wait 12 hours after observation of standing estrus before inseminating. Results from Nebel's research suggest if exact time of onset is unknown, timing of insemination from detection should be performed within four to 12 hours for optimum conception rates.

In other words, if a producer observes a cow in heat at 7 a.m. he would normally wait until that evening to breed the cow. But the cow's onset of estrus may have actually been midnight, so the optimum time for breeding would have been noon, not 7 p.m.

The HeatWatch system was used by Colorado State University (CSU) scientists to describe estrous behavior in beef cows. Using the system, CSU staff were able to identify the time and frequency of mounting.

The objectives of their experiment were:

1. To describe the characteristics of estrus in beef cows that were either synchronized or not synchronized for estrus; and
2. To evaluate various methods of attaching the electronic transmitter to the rump of the cow.

According to their findings, there is a high degree of variation in the mounting behavior of cows, and it appears cows synchronized for estrus have a longer period of mounting behavior with more mounts than cows evaluated during their return estrus (see Table 1).

They also found more cows that initiated standing estrus between 6 a.m. and noon than during any other six-hour period of the day. Among nonsynchronized cattle, 27.6% of the cows displayed mounting behavior only during darkness hours (9 p.m. to 5 a.m.).

According to Whittier, one of the biggest problems related to the system is keeping the patches on. The CSU researchers found if they trimmed the hair on the cow's tailhead to 3/8 to 1/2 inch long it improved retention. The worst scenario is when the cows are shedding their winter hair.

According to Whittier, the company is working on developing easier, quicker and more dependable patches.

How do you buy the system, and is it affordable? Current U.S. retail price for the system is $4,000, which includes the buffer, receiver and software. Transmitters are $55 a piece and can be reused. Customers can buy or lease-to-own the HeatWatch system.

Other expenses include the glue and the patches. Producers can purchase the glue from DDx. The company offers the glue in tubes and in a spray form. The tube glue costs $7.42 and is enough for approximately 6 cows. The spray costs $10.60 and is enough for 10 cows, according to Watts.

"The initial cost may be a disadvantage to some operations," explains Hillman. "There are so many advantages that we feel it is a cost-effective system."

Producers could see economic returns in less than a year due to increased conception rates, decreased labor and more AI calves born. When considering the system, Whittier suggests doing an economic analysis to calculate how the system will work in each individual operation's budget.

DDx Inc. has the patent on the HeatWatch technology, which is used by more than 500 farmers and ranchers in the United States, Canada and Mexico. The company is headquartered in Denver. For more information about the HeatWatch system, call 1-800-375-6624, or visit HeatWatch web site at *www.heatwatch.com*.

TABLE 1. Characteristics of mounting behavior as measured by HeatWatch™

Item	Rigden[a] No.	Rigden[a] %	ECRC[b] No.	ECRC[b] %
Cows with transmitters mounted at least once as measured by HW[c]	35/110	31.8	122/125	97.6
Cows that met predetermined breeding criteria[d]				
Cows mounted	29/35	82.9	1001122	82.0
Cows with transmitters	29/110	26.4	100/125	80.0
Time of day behavior began[e]				
Midnight to 6 a.m.	4/29	13.8	14/100	14.0
6 a.m. to noon	10/29	34.5	41/100	41.0
Noon to 6 p.m.	7/29	24.1	27/100	27.0
6 p.m. to midnight	8/29	27.6	18/100	18.0
Cows mounted only during dark (9 p.m. to 5 a.m.)	8/29	27.6	3/100	3.0
Detected by HW[f]	29/29	100.0	100/102	98.0
Detected visually	6/29	20.0	77/102	75.5

	Rigden[a] x+sd	Rigden[a] range	ECRC[b] x+sd	ECRC[b] range
Number of mounts/female	21.7±19.6	68-2	48.2±42.3	211-2
Length of activity per cow, hr.	7.9±6.4	23.9-.02	12.4±5.6	26.8-0.1
Duration of mounts, seconds	4.5±3.5	21.8-2.0	3.5±1.9	24.0-2.0

[a] Cows at Rigden were synchronized for estrus and the period of estrous detection reported here was during the 3-week return estrous period.
[b] Cows at ECRC were synchronized for estrus using one of three synchronization regimens described by LaFever et al. (1996). The period of estrous detection reported here was during the 7 days of synchronization.
[c] HeatWatch Electronic Heat Detection System, DDx Inc., Boulder, Colo.
[d] Two mounts in a one-hour window with a mount duration of one second or greater.
[e] Actual distribution differs from expected ($P < .01$).
[f] More ($P < .01$) cows were detected with HeatWatch than with visual detection.

INSTALLING THE PATCH

Properly installing the patch the first time can save time and expense. HeatWatch staff suggest producers follow these six steps when applying the patch.

1 **Restrict the movement of each cow to apply the patch. Most users put the cow in a headgate.**

2 **Optimally, the cow's tailhead should be washed thoroughly and blown dry with a dryer or air compressor. At a minimum, remove dirt, loose hair and debris from the cow's tailhead area using a brush or currycomb. During seasonal shedding, take extra care in removing loose hair prior to patch application. Clip hair during the shedding season. Excess hair and dirt are the primary causes of poor patch adhesion.**

3 **Apply glue following recommendations from HeatWatch**

4 **Hold the patch over the small indentation on the cow's tailhead with the bottom of the patch toward the cow. Place the pouch as close to the center of the spine as possible.**

5 **Turn the patch pouch-side up, and orient the patch so the Velcro-enclosure flap points toward the cow's head.**

6 **Be certain the patch is secure prior to beginning patch installation on the next cow.**