Recognizing Heat Signs in Heifers

Poor heat detection in heifers delays breeding, and frustrates dairymen to the point where a bull is sometimes substituted for the A.I. technician. It is the primary reason that a smaller percentage of heifers are bred A. I. compared to older cows, even though heifers usually have a higher conception rate. Heat detection efficiency can be improved considerably by observing heifers on a regular schedule and recognizing all the signs of heat.

Although the greatest amount of riding activity probably occurs between midnight and 6:00 a.m., 15 minutes committed just to observation in the early morning and later afternoon will catch most heifers exhibiting heat. Also be on the lookout for signs of heat any time you are working around the cattle.

Standing to be mounted is the primary and surest sign of heat and the most common indication of estrus used *(Figure 1)*. On the average, a heifer remains in standing heat for 14-16 hours, and will ovulate 10 hours after the end of standing heat. However, to be noted in standing heat, the heifer must be mounted by another animal which doesn't always occur or doesn't happen while the heifer is being observed.

Figure 1

To maximize the amount of estrus behavior during the observation period, it is an excellent management practice to turn the heifers into a dirt lot, away from feed bunks, for heat detection. Both the effects of movement and good footing will increase activity. If a heifer is in heat, there may be several mounts in the first few minutes in the new lot. After the observation period, put the heifers back in their regular lot. Try to keep open heifers together, because there will be more estrus activity if there is a bunch of cycling animals together. If there are only a few open heifers left in a group, move them to a pen of open heifers.

Unless observation is continuous, which is impractical, many mounts will be missed. Occasionally, heifers may stand to be mounted briefly even though they are not in heat or may even be pregnant. Therefore, to maximize breeding efficiency, take into account the many secondary signs of heat. Secondary signs vary in length and may start a day before standing heat and continue for a day after standing heat.

Heifers coming into heat and in heat are generally more active. They may walk the fenceline or pace back and forth across the barnyard *(Figure 2)*. They may bellow considerably and urinate frequently. Animals that are in or near heat may attempt to mount other heifers that may or may not be in estrus and may also spend time butting heads with other animals. A heifer that attempts to mount the front end of another heifer is usually in heat.

Figure 2

Other behavior changes include the heifer testing other heifers by resting her chin on their rumps or loins. The heifer may nudge, lick or sniff the vulva of other heifers and then wrinkle its nose and curl its upper lip, similar to a bull (flehmen response). A clear, chrystalline mucus is secreted by the vagina of a heifer in heat. The mucus may be seen draining from the vulva, appear as strings of mucus on the tail, or be smeared on the animal's thigh *(Figure 3)*. It will glisten in sunlight and artificial light. In fact, checking the rears of cows for this chrystalline mucus with a flashlight, with the barn lights off, prior to the morning milking is a good heat detection aid. It is sticky and should stretch for more than 4 inches when touched by two objects and pulled apart. Contrasted with nonestrus vaginal mucus secretions which are much smaller in quantity, cloudy rather than chrystalline and less sticky, this clear mucus discharge is a good indicator of heat.

Figure 3

There may be noticeable physical changes in some heifers. The vulva may swell with a reddened lining. It will have a puffy appearance, and instead of many fine wrinkles, it will have fewer, deeper wrinkles *(Figure 4)*. The secreted mucous may mat the hair and give the lip of the vulva a wet appearance. The pelvis may rotate causing a slight depression in the loin and an elevated tail or tailhead.

Figure 4

If a heifer has been ridden, the hair on her tailhead may become ruffled or rubbed off *(Figure 5)*. In muddy conditions, there may be mud on her rump and flanks. Even though not directly seen in standing heat, these are telltale signs that she was recently in heat and may conceive from an insemination at this point.

Figure 5

Approximately 90% of heifers will have a small bloody discharge 1 or 2 days after estrus. This may be noticed as a discharge from the vulva or as a string or smear of blood on the tail or flank. This discharge is from the breaking of small blood capillaries in the lining of the uterus caused by changing hormonal levels during and after estrus. It is not related to whether the heifer conceived or not.

Usually, it's too late to breed a heifer when you notice blood. Record the heat on a heat expectancy chart so you can anticipate the next heat period. An alternative that may get her bred earlier would be to wait 10 days, then inject her with prostaglandin and breed her when she comes into heat or 80 hours after injection.

All of the rules relative to catching heifers in heat also apply to cows. Cows may also have a decrease in milk production while they are in heat.

Using a Heat Detection Aid

Heat in cattle can be missed because of several factors even when they are observed 2 or 3 times daily. Up to 25% of animals are in standing heat for less than 8 hours. In addition, animals may be mounted only 5 or 6 times during their heat period. For these reasons, heat detection aids can help detect animals that stand to be mounted between observation times. Using both heat detection patches and paint can be more effective than using either by itself.

When using a heat detection patch, it is important to apply it properly in the correct position. Generally, the patch should be placed about a third of the way from the hooks toward the pins *(Figure 1).* For animals with high tailheads, place the patch further back toward the tail. Use good judgment in determining the best position so it will come into best contact with the mounting animal.

Figure 1

To prepare the site for the patch, first remove dirt and loose hair with a currycomb. If the hair is extremely long, as under winter conditions, you may clip it down to 1/2 inch in length. Apply a gob of glue about the size of a quarter *(Figure 2)*. Use the spreader to spread the glue. Press firmly to assure good penetration of the glue. Next, put a smaller gob of glue on the back of the patch. Use the spreader to spread it out evenly to all the edges. With the arrow pointing forward, press the patch on the prepared area of the tailhead.

Here are a few additional tips on applying detectors:

1. Do not use too much glue. Detectors will not stay on as well if an overly generous amount of glue is used.
2. Store detectors in a cool, dry place and use before expiration date.

Figure 2

3. Don't allow glue in the tube to freeze.
4. Write the animal's ID number on the detector *(Figure 3)*. If a detector is lost, perhaps during mounting activity, it can be rematched to the animal.

Figure 3

5. If a new detector is to be placed on an animal and the old one is still firmly attached, cut off the plastic bubble and cement the new detector over the old one.
6. Remove obstacles that cattle may rub against and falsely trigger the detector.

After the detector is in place, paint can be applied over the midline of the rump from the hooks to back over the tailhead *(Figure 4).* Use a stiff brush to apply the paint, making sure that the paint penetrates down to the skin. Make a final backward stroke to produce a smooth strip of paint about 8 inches long and 2-3 inches wide. Both water soluble latex or oil-

based paints are suitable, or you may purchase a specially-developed heat detection paint from your A.I. supplier.

Figure 4

The paint can aid in heat detection because it is rubbed off when the animal is mounted. Different color paint can be used, depending upon breeding status. For example, all animals that have not been bred can be painted yellow. Once bred, their tailheads can be painted blue. At a glance, you can see which animals have and have not been bred. After animals are bred, you may wish to just use paint without applying another detector.

Marking crayon can be used instead of paint. The crayon may be more convenient to handle and apply. But under humid conditions, it may require daily application, while paint needs replacement only every 1-3 weeks.

All animals should be observed for visible signs of estrus and triggered heat detection aids at least twice daily. If the heat detector has been triggered or is missing and the paint has been rubbed off *(Figure 5)*, the animal was probably in heat. Try to confirm this with other visible signs of heat or behavior changes before breeding the animal. False positives do occasionally occur, but are less likely when heat detectors and paint are used in combination. If the heat detector is missing or triggered but the paint is not rubbed off, it is questionable whether the animal was in heat.

Figure 5

An alternative or addition, is to use an implanted free-martin heifer or small, healthy cull cow to help find animals in heat. Four implants of Synovex H are placed in each ear in different locations. Eighty percent of heifers will respond in 1 to 2 weeks and stay active for 4 to 6 months.

Heat Synchronization

Heat synchronization can reduce time required for estrus and help get heifers bred at younger ages as well as getting cows rebred with fewer days open. Products and programs for synchronizing cattle are changing and new ones are under development. Synchromate-B for heifers has recently been taken off the market at least temporarily in the United States leaving prostaglandin injections given alone or with the feeding of MGA as the one alternative for heifers. Prostaglandins alone or with GnRH in an Ovsynch program are popular for dairy cows. Intravaginal devises for heifers are currently under development.

Synchromate-B

The equipment needed to use syncromate-B includes a restraining chute, small table or work bench, disinfectant, shallow pan, small scrub brush, implant gun, small syringe with one inch, 16-gauge hypodermic needles, slender forceps and hair clippers *(Figure 1).*

Figure 1

Restrain the heifer. Limit movement of her head as much as possible. Prepare the ear for implanting by clipping the hair on the ear midway between the base and tip *(Figure 2).* Clipping makes implanting easier and more sanitary. Scrub the area with a brush and disinfectant.

Affix a sterile needle to the implant gun. A sterile needle is needed to avoid infection and prevent transfer of blood-borne disease organisms from one heifer to another. Remove the sheathed implant from the foil pack and load it into the implant gun. Let the plunger rest against the implant and push the implant 1/16 inch out of the sheath.

With the beveled part of the needle away from the ear, insert the needle just under the skin. Avoid hitting any major blood vessels or puncturing the cartilage. Push the needle between the skin and cartilage *(Figure 3)*. With the needle in all the way, push the plunger to eject the implant under the skin (subcutaneously). The outline of the implant should be visible through the skin. The implant contains Norgestomet, which acts similar to progesterone.

Figure 2

Figure 3

An injection containing Norgestomet and estradiol valerate (estrogen activity) is given at the same time as the implant. These compounds are relatively safe, will not cause abortion and work at any point in the estrus cycle. This injection is given intramuscularly (IM) in the neck or in the thigh below the pins. A sterile needle should be used for each animal to prevent infection and contamination of the unused portion of the liquid left in the bottle *(Figure 4).*

After 9 days, again restrain the heifer for implant removal. Disinfect the back of the ear. With the tip of the disinfected forceps, open the original needle opening (which will now be partially healed) up to the implant *(Figure 5)*. Once the opening is reestablished, you may remove the implant by pushing on it with your thumb nail.

Figure 4

Timed insemination needs to be done 48-54 hours after the implant is removed from the ear. Labor required for heat detection is eliminated. However, if a heifer is noticed in heat, it is preferable to breed her 12 hours after heat is first exhibited.

Figure 5

Prostaglandin
Prostaglandin (Lutalyse, Estrumate, Bovilene) injection synchronizes estrus by causing the regression of the CL (corpus luteum). There are many different ways prostaglandins can be incorporated into breeding programs.

Alternative 1: Check heat for 5 days - breed animals caught. Day 6 - inject remaining animals. Breed animals after they come into heat. 96 hours after injection breed all animals not yet bred.

Alternative 2: Inject all animals 11 days apart. Begin heat detection after second injection and breed after caught in heat. 96 hours after injection breed all animals not yet bred.

Alternative 3: Inject all animals and check for heat for 6 days - breed after caught in heat. Day 11 – re-inject all animals not yet bred and breed as in Alternative 2.

Expect conception rates to be the same as non-synchronized animals if animals are bred when showing signs of heat. Conception rates are generally lower if animals are timed bred without estrus observed.

Prostaglandin plus MGA
MGA is not approved for lactating dairy cows but can be fed to heifers to synchronize estrus. MGA is fed for 14 days at the rate of 1/2 mg. per head per day. The MGA is then withdrawn from the feed and a prostaglandin injection is given 19 days later. All heifers are bred 72 hours after the prostaglandin injection or as they come into estrus.

Ovsynch Program
The ovsynch program for lactating dairy cows was introduced about five years ago and has been successfully used on many dairy farms. It synchronizes ovulation more so than estrus. In fact, many cows will not show signs of estrus on the program. The basic program is 3 injections. Recent studies have shown a good increase in conception rate using 5 injections. The basic program is to give a 2 cc injection of GnRH on day 0, 5 cc injection of prostaglandin on day 7, and a 2 cc injection of GnRH on day 9. The cows are bred 16 hours later. With the 5 injection programs 2 additional injections of prostaglandins are given 26 and 12 days before the first GnRH injection. Some people have been successful reducing the GnRH dose from 2cc to 1 cc. If the reduced dosage is used, the injection should be given deep in the muscle with a 20 gauge 1 1/2 needle to prevent run back. Another practice shown to increase conception rates is to give BST at the same time as the first GnRH injection.

With any synchronization program, it is important to have a follow up program after the animals are inseminated. An example would be to chalk tailheads eighteen days after the insemination and observe for estrus. Breed animals observed in heat. All animals not returned to estrus should be pregnancy checked between 38 and 45 days.

	Synchromate-B	**Prostaglandin**	**Prost. + MGA**	**Ovsynch**
Wholesale cost	$6.00-$8.00	$1.50-$2.00	$3.00-6.00	$5.00-$9.00
Requires Implant	Yes	No	No	No
Causes Abortion	No	Yes	Yes	Yes
Works all Days of Heat Cycle	Yes	Only Days 5-18	Yes	Yes
Ability to Synchronize Heats	Excellent	Good	Excellent	Excellent
Must Obtain Through Veterinarian	No	Yes	No	Yes
Approved for Lactating Cows	No	Yes	No	Yes

Artificially Inseminating Cows

Proper and thorough initial training from professional personnel is required to learn how to artificially inseminate cattle. It's important to review techniques periodically to avoid adopting poor procedures that may lower conception rates. Poor habits can be picked up over a period of time without the inseminator being aware of the change in his routine.

If stored in a cold area, warm the insemination gun and sheath prior to loading the semen into the gun. Once the insemination gun is loaded, place it under your coveralls or shirt *(Figure 1)* to prevent exposure to cold or sunlight, both of which are detrimental to sperm survival. Post-thaw temperature fluctuations will damage sperm.

Figure 4

A disposable plastic glove-sleeve is used for cleanliness and protection from disease. Lubricating the glove will make entry into the rectum easier and reduce irritation to the cow. Lubricants are available from A. I. suppliers, or a mild lubricant such as K.Y. Jelly or mineral oil may be used. Avoid using detergents or soaps that may be irritating to the rectum and harmful to sperm if contact is inadvertently made with the semen.

After the hand is inserted into the rectum and fecal material removed, locate the cervix. Gently feel the uterine horns to determine if everything is normal and the cow is ready to inseminate *(Figure 2). Figure 3* shows a normal, open tract on the right and a pregnant tract on the left. The pregnancy is in the left horn and is about 50 days along. If the horns do not seem normal, it would be wise to have a veterinarian check the cow on his next visit.

Figure 2

Figure 3

With your free hand, thoroughly wipe the area around the vulva with a paper towel before inserting the insemination gun. By bringing the hand in the rectum toward the rear of the rectum and exerting a slight backward and downward pressure with the wrist, it is possible to open the vulva lips to make insertion of the insemination gun easier and more sanitary. Usually, the gun will slide easily right up to the cervix.

To start the gun into the cervix, grip the end of the cervix nearest you and manipulate it over the tip of the gun. If need be, push the cervix forward to free the insemination gun from folds in the vagina. After the gun tip starts into the

cervix, manipulate the cervix to ease passage of the instrument through the rings into the body of the uterus, where the emerging gun can be felt. Never force the insemination tube. Do not insert the gun beyond the body of the uterus, as the uterine walls are fragile and can be damaged.

Feel the end of the cervix and insemination gun between thumb (over top) and index finger (underneath). Pull the gun back into the cervix about 1/4 inch for deposit position. *Figure 4* illustrates the proper placement of the gun for deposition of the semen in a cut-away view of the reproductive tract. The tip of the insemination gun should be over the third ring, so semen flows unrestrained into the body of the uterus.

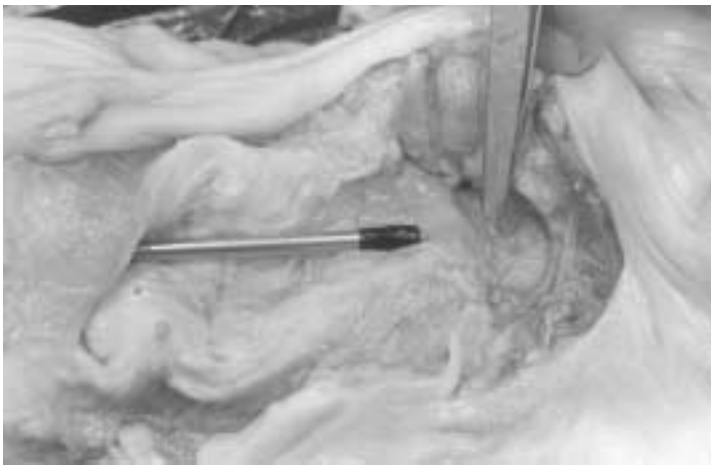

Figure 4

As you get ready to make the semen deposit, keep hold of the cervix to make sure its relative position to the insemination gun does not change. Make sure your forefinger is not blocking the flow of semen. Depress the metal plunger over an 8 to 10-second period to deposit the semen *(Figure 5).* Do not pull back on the gun or change the position of the tip of the insemination gun as the deposit is being made. Maximum conception rate will be realized if all the semen is deposited in the proper position to assure sperm transportation into both uterine horns.

Figure 5

After the insemination gun is withdrawn, check to make sure all the semen was deposited and that there was no abnormal discharges from the reproductive tract on the sheath. Reverse strip your glove off your arm so that the used sheath and manure is trapped inside. Dispose of properly.

Even if multiple cows are being inseminated at the same time, a new disposable glove should be used on each cow. This same recommendation is important when doing pregnancy checks or reproductive palpations. Using the same glove on multiple cows greatly increases the danger of passing blood born diseases, such as leukosis, from cow to cow.

The procedures outlined here are for depositing semen into the body of the uterus. Some people advocate horn breeding, but that procedure has not been as widely accepted. Choice of procedure is one of personal preference as they both have given acceptable results.

Storing and Handling Frozen Semen

Frozen semen remains viable for years if properly stored and handled. Improper handling can render it useless in a few seconds. Therefore, it is important to use proper procedures to safeguard your investment.

Semen is stored at -320ºF in a cryogenic tank filled with liquid nitrogen. The semen is safe as long as there is liquid nitrogen in the tank, but is ruined in a matter of minutes if the tank runs dry. Semen tanks must be handled with care to prevent damage, which may break their vacuum seal. If the tank must be moved, always pick it up by both handles and set it down gently. The tank should be stored on wooden blocks or a pallet rather than on concrete to prevent corrosion. To check the nitrogen level, lower a measuring stick, which can be obtained from you're A.I. supplier, to the bottom of the tank. After 10 seconds, remove the stick and wave it in the air. The frost line on the stick indicates the nitrogen level *(Figure 1).* Record the reading. Weekly checks will indicate any abnormal nitrogen losses. The chart below will help to determine the proper nitrogen level at each check. If you notice rapid nitrogen loss, frosting or sweating, semen should be moved into another tank immediately.

Figure 1

Ideal Nitrogen Levels in Your A.I. Tank

Weeks after refill	Tank type, 4-week	8-week	16-week	20 to 24-week
	- - - - -ideal nitrogen level in centimeters - - - - -			
1	23			
2	18	23		
3	10 to 13			
4	3 to 5	10 to 13	23	
6		18		23
8		3 to 5	18	
12			10 to 13	18
16			3 to 5	18 10 to 13
24				3 to 5

Source: ABS Global, Inc. *A.I. Manual*, 1996

Figure 2

Keep a semen inventory record near the tank *(Figure 2)*. The inventory needs to identify semen, quantities left and proper canister assignment. This record will help locate semen quickly without unnecessarily exposing semen to warm temperatures while hunting for a specific straw. An inventory also helps determine needed semen purchases. There is little reason to have more than a 6 month semen supply. Semen becomes genetically outdated as new and better bulls continuously become available. Discard genetically inferior semen.

The most common semen package is the 1/2 cc. straw. When removing semen, never raise the canister above the frost line, which is about 2-3 inches from the top of the neck tube *(Figure 3).* Semen can be damaged if exposed to temperatures above -112ºF, which is the temperature near the frost line. Temperatures increase to 0ºF at 1 inch from the top of the neck tube and 36-54ºF at the top of the neck tube, depending on room temperature and level of nitrogen in the tank. The damage to sperm from exposure to elevated temperatures is cumulative. Recrystallization of ice begins with

exposures to temperatures above -112º'F, which will lower semen quality even if exposure is for only a few seconds.

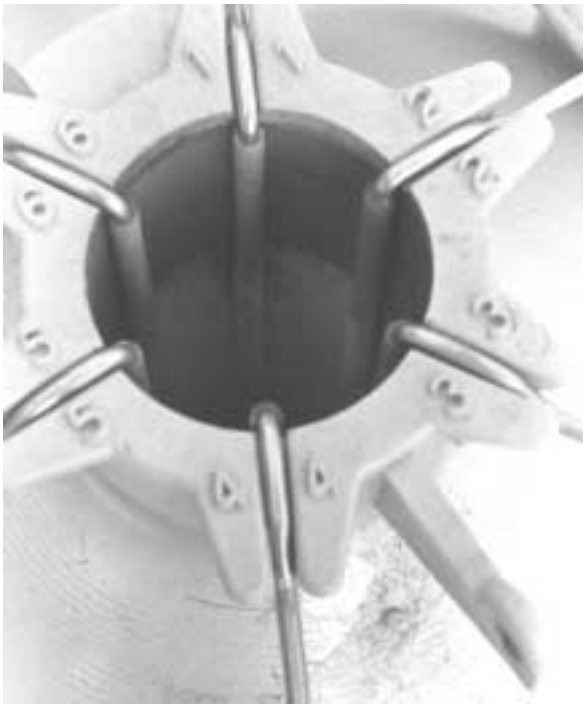

Figure 3

To remove semen, raise the canister just high enough to identify the sire by the top of the cane *(Figure 4)*. Lower the canister briefly to equalize the temperature, raise it again and quickly remove the desired straw. If the straw is not removed within 7 seconds, lower the canister back into the tank for about 30 seconds to equalize the temperature of the semen back to -320ºF. Then raise the canister again to remove the straw.

Figure 4

Hold the removed straw on the sealed end as you remove it from the tank. Otherwise, unequal thawing will result where your fingers touch the straw. Shake the straw sharply to remove the nitrogen from the cotton plug, and thaw according to semen supplier recommendations. General recommendations are to drop the straw immediately into warm water (90-95ºF) after removal from the canister. Thaw the semen for at least 40 seconds. This procedure will give satisfactory results with all 1/2 cc. straws.

Don't guess the water temperature. Use a thermometer. Periodically, check the thermometer against another one to make sure it is accurate. A thermos with a thermometer is highly desired *(Figure 5)*. These units can be purchased from A.I. suppliers for $10-15. Electronic thaw devices are also available. It is safest and highly recommended to thaw semen one straw at a time, and get it into the cow as soon as possible. However, satisfactory results have been obtained by thawing up to 10-15 straws at once if proper procedures are used. Straws should be stirred so that they don't "freeze" together during the thawing process. Waterbath temperature needs to be maintained until the straw is removed.

Figure 5

Once a straw has been removed from a nitrogen unit, it must be used or discarded. In 80ºF air, an individual straw warms to -112ºF in only 3 seconds. Even though it still may appear frozen, the straw should not be returned to the tank.

Hopefully a few of these hints will aid your A.I. breeding program.