Many dairy producers are artificially breeding their own cattle. A recent survey estimated that approximately 63% of the dairy cattle bred artificially in the United States are bred by owner-inseminators. In some states this figure may be lower, but the increase in owner-inseminators is still quite apparent.

Various training programs are available to dairy farmers interested in receiving instruction on artificial insemination (AI) technique. Some breeding organizations conduct intensive three to five day training schools; other organizations prefer to provide instruction on an individual on-the-farm basis. Most agricultural colleges devote a whole course or part of a course to the technique of AI. Many good, complete training programs are being conducted. However, the intensity of training and specific recommendations given to the participants may vary considerably among training programs.

In developing the manual skills of AI, trainees should work with numerous excised reproductive tracts and receive considerable practice inseminating a variety of live cows. Developing the skill to thread the insemination rod through the cervix should not be the only objective of an AI training program. Along with the technique of cervical penetration, the importance of sanitation must be emphasized and skills perfected to consistently identify the proper site of semen deposition and accurately deposit the semen. In addition, the trainees should obtain a working knowledge of reproductive anatomy and appreciate the essentials of a sound reproductive management program.

Unlike professional technicians whose insemination proficiency is monitored by nonreturn rates calculated by the breeding organizations, the conception rate of owner-inseminators is not monitored and retraining is not provided on a routine basis. This fact sheet reviews some important aspects of AI technique with special emphasis on reproductive anatomy, sanitation, and accuracy of semen deposition. This is not an instruction manual describing all the critical steps, hand movements and procedures necessary to inseminate cattle.

Reproductive Anatomy
Failure to understand the anatomical (Fact Sheet IRM-1) and functional relationships between the various tissues and organs of the reproductive system may lead to consistent insemination errors. Most AI training schools use excised tracts to illustrate general anatomy. Oftentimes the tracts are dissected open to view the interior of the uterus. These are very useful exercises. However, dissection can tend to distort the relationship between various regions. Fig. 1 is a radiograph (photograph of an X-ray) of the cow reproductive tract. This technique allows one to view the intact tract and simultaneously observe the interior of the uterine body and horns and in many cases the cervical canal.
The target for semen deposition, the uterine body, is the area between the internal cervical os and internal uterine bifurcation where the uterine horns begin to be separated (Fig. 1). Based on measurements taken from radiographs of 580 reproductive tracts, this distance averaged 5/8 inch. Two-thirds of the tracts had a uterine body length between 3/8 and 7/8 inches. Obviously there is not much room for error in placement of the insemination rod.

While the reproductive tract is being palpated to find the anatomical landmarks for insemination one usually obtains an idea of the overall size of the reproductive tract. Some inseminators may have the impression that the larger the cervix or the longer the reproductive tract, the larger the uterine body. This assumption is incorrect. There is not a strong relationship between size of the uterine body and the diameter of the cervix or length of the reproductive tract. Do not be misled into making insemination errors because of misconception about size of the uterine body in relation to the reproductive tract's overall size.

Preparation and Sanitation for Insemination

- Insure that the cow to be bred is truly in estrus. Remember, research studies indicate between 7-20% of the cattle inseminated are not in estrus.
- Prior to thawing the semen, restrain the cow in a familiar area free of stressful conditions. Unnecessary excitement may interfere with mechanisms important to achieving good conception rates.
- Keep inseminating supplies dry and clean at all times. Store breeding sheaths in the original package until used.
- Once the inseminating device is assembled, protect it from contamination and cold shock temperatures.
- Do not allow materials used to lubricate the rectum to come in contact with the vulva region. Lubricants are generally spermicidal. Avoid using irritating products.
- Thoroughly wipe the vulva region clean with a paper towel. This helps prevent the interior of the reproductive tract from becoming contaminated and possibly infected. Insert a folded paper towel into the lower portion of the vulva. Place the inseminating rod between the folds of the towel and insert it into the vagina without contacting the lips of the vulva.
- Use protective rods or sheaths in herds or for specific cows where vulvovaginal infection is a problem. When this technique is used, the standard insemination rod and plastic sheath are inserted into the larger protective rod or sheath. Pass this double rod combination through the vagina to the external cervical opening. At the cervix, puncture the tip of the protective device with the insemination rod and then thread it through the cervix. Only use this technique following the recommendations of a veterinarian, extension specialist or AI person, when specific diseases have been diagnosed or suspected.
- Develop good sanitary procedures and insemination practices when learning to breed cows. Hopefully the good habits will be maintained.
General Tips for Insemination Technique

● To avoid the possibility of entering the urethral opening on the floor of the vagina, insert the inseminating rod into the vulva at a 30° to 40° angle.

● The anterior portion of the vagina, termed the fornix vagina, tends to stretch rather easily when the insemination rod is pushed forward and beyond the cervix. This may give the false impression that progress is being made in advancing the rod through the cervix when indeed it is above, below or to either side of the cervix. However, one should be able to feel the rod within the vaginal fold. When the rod is within the cervix the rod tip cannot be felt.

● Remember, place the cervix onto the inseminating rod. Maintain slight forward pressure on the rod while the cervix is manipulated slightly ahead of the rod.

● The target for semen deposition is the uterine body. The target is quite small (Fig. 1). Accurate rod tip placement is probably the most important skill involved in the whole Al technique. Generally inseminators identify this target area by feeling for the end of the cervix and the tip of the rod as it exits through the internal os or opening. Consistently depositing the semen in the cervix or either uterine horn will result in lower conception rates.

● Once the rod tip is properly positioned, flush with the cervical os, deposit the semen. Take about 5 seconds for semen deposition. Slow delivery maximizes the amount of semen delivered from the straw and minimizes the flow of semen unequally into one uterine horn.

● During the process of semen deposition, one must insure that the fingers of the palpating hand are not inadvertently blocking a uterine horn or misdirecting the flow of semen in some manner.

● Be careful not to pull the inseminating rod back through the cervix while expelling the semen.

● If the cow moves during semen deposition or if the rod slips, stop and correctly reposition the rod tip.

Accuracy of Insemination

Many research studies have shown that optimum conception rate is achieved when semen is deposited in the uterine body compared to deposition in other anatomical regions. Pennsylvania researchers used radiography to evaluate the accuracy of insemination technique among 20 professional technicians and 20 owner-inseminators. Each participant inseminated twenty reproductive tracts to the best of their ability. Two radiographs were evaluated for each insemination. The first was taken after positioning of the insemination rod and the second after semen deposition. Placement of the rod tip was assessed from the first radiograph and semen distribution from the second.

Analysis of radiographs of all inseminations indicated that only 39% of the rod tip placements were within the uterine body. Percentage of placements in the cervix, right uterine horn and left uterine horn were 25%, 23% and 13%, respectively. Based on the second radiograph, only 40% of the dose of semen was located in the uterine body or equally distributed in both uterine horns. The remaining 60% of the semen was located in the cervix or disproportionately in one uterine horn. Accurate semen distribution was significantly related to proper insemination rod placement. See Figs. 2a and 2b for correct rod tip placement and semen distribution. See Fig. 2c and 2d for one example of an incorrect Al technique.

There were no differences between professional technicians and owner-inseminators in accurate rod tip placement or semen distribution. However there was considerable variation among all inseminators in their ability to correctly position the inseminating rod. Among all the participants in this study, the percentage of correct placements within the uterine body ranged from zero to 85% of the insemination attempts. These individuals are probably a representative sample of professional technicians and owner-inseminators breeding cows throughout the country. This information clearly indicates that consistent placement of the rod tip within the uterine body is a very difficult task.

Accurate insemination technique requires concentration, attention to detail, a clear understanding of reproductive anatomy and the ability to identify the target area and properly position the insemination rod. The variation in this study and others suggests that certain individuals have acquired or perfected these skills to a much greater degree than others. It further demonstrates the need for routine retraining and updating of professional Al technicians and owner-inseminators.
Fig. 2. (a) Proper placement of the insemination rod tip at the internal cervical os. (b) Distribution of radiopaque semen within the uterine body. (c) Improper rod placement in the right uterine horn. (d) Radiopaque semen deposited in the right uterine horn. (adapted from Peters and Senger, 1983, with permission of the J. of Dairy Science).
Table 1. Effect of Retraining Professional Technicians Using the Dye Technique.

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<td>Retraining</td>
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<td>4 Months Before</td>
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<td>4 Months After</td>
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Evaluating Your Success and Retraining

Owner-inseminators should monitor their herds’ conception rate. Every six months carefully examine the breeding chart and calculate the first service conception rate for the herd during that interval. Consider only those cows that have been bred long enough to have been pregnancy checked. Strive for a goal of 60% first service conception. In smaller herds there may not be enough first services during a 6 month period to accurately determine conception rate. In such herds summarize first services over 12 months or calculate the percent cows pregnant by three services. Greater than 90% of the cows should be pregnant after three services. Very large herds may need to calculate conception rate more often than every 6 months.

Services per conception is another index of breeding performance related to the effectiveness of insemination technique. A reasonable goal is to maintain services per conception below 1.7. Dairy producers must realize that other factors in addition to AI technique can affect conception rate and services per conception (Fact Sheet IRM-10).

Your veterinarian also can provide some helpful information. As your veterinarian checks for pregnancy, record which uterine horn is pregnant. Generally between 55% and 60% of the ovulations occur on the right ovary and consequently there should be slightly more pregnancies in the right horn. If the pregnancy ratio for your herd is greatly different from 60 right: 40 left it may be a clue that you tend to deposit semen in one uterine horn versus the other. Data from at least 100 pregnancies are needed to make this a valid comparison.

If after evaluating records it appears insemination technique may be a problem area, then consider attending an AI retraining session. See Table 1 for the effectiveness of retraining. If the magnitude of improvement is 8% for professional technicians it may be even greater for owner-inseminators.

All owner-inseminators should periodically attend a retraining course to review their techniques and be updated as to the new developments and recommendations regarding AI technique.

Trade or brand names are mentioned only for information. The Cooperative Extension Service intends no endorsement nor implies discrimination to the exclusion of other products which also may be suitable.