Artificial Insemination Technique Needs Attention

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Introduction

Significant variation exists among inseminator conception rates, (Graham, 1966; Senger et al., 1981, Ron et al., 1983; Senger et al., 1983 and Uwland, 1983). This variation is due at least in part to differences in skill levels of inseminators. During the last 15 years, artificial insemination responsibility has been transferred from professional technicians to herdsman-inseminators (H-I). Current estimates report that approximately 65 percent of semen is sold directly to dairy and beef herds resulting in producers performing the majority of inseminations. Often, poor insemination skills on the part of herdsman-inseminators are not recognized and the deficiencies may translate into poor reproductive performance. Until recently several major problems have existed regarding the evaluation of insemination technique. They are: 1) Errors in inseminating technique specific to an individual inseminator have not been described critically; 2) there is a significant amount of misunderstanding among inseminators regarding reproductive tract anatomy. This paper will summarize several previously published reports which deal with problems in A.I. technique.

Radiographic Evaluation of Insemination

The details of the radiographic procedures are presented elsewhere (Peters and Senger, 1983). This radiographic procedure enables detailed observation of the interior of the reproductive tract and also allows for exact syringe tip and semen location to be evaluated (figure 1,2).

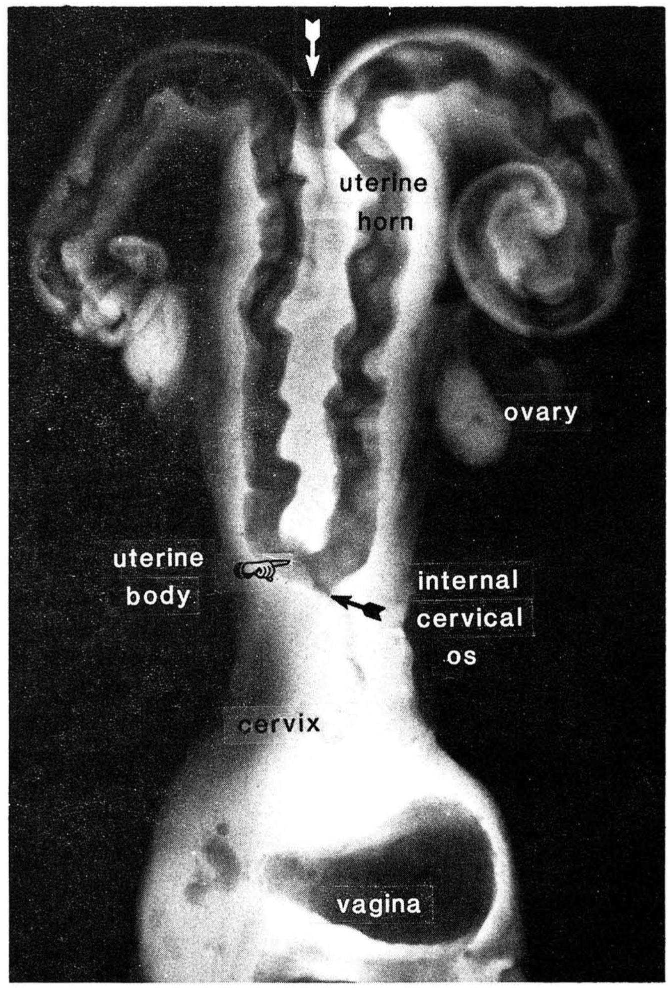

FIGURE 1. Radiograph of an excised bovine reproductive tract with major anatomical components labeled. White arrow indicates external uterine bifurcation. (Modified from Peters and Senger, 1983).

Evaluation of radiographs similar to those shown above constituted the basis for two separate experiments to evaluate A.I. skill. Ideal syringe tip placement was considered to be within the uterine body or at the internal cervical os. Ideal inseminate distribution was considered to be a pool of inseminate located in the uterine body and/or equally distributed with the lumen of each uterine horn. (MacPherson, 1968). Therefore, inseminate in the lumen of the uterine horns was considered acceptable, provided that the distribution was equal between the right and the left uterine lumina. Disproportionate distribution of inseminate in one uterine horn was considered undesirable as was inseminate located within the cervix. Twenty professional and twenty herdsmen-inseminators were compared with regard to their ability to position the syringe tip in the uterine body and to deliver the inseminate to that region. (For a more detailed description of the experiment see Peters et al., 1984).

Statistically, there was no difference (P=.13) between professional and herdsmen-inseminators with regard to their ability to position the syringe tip in the uterine body (figure 3, 4, and 5). There was however, significant variation (P=.001) among inseminators within each category (professional or herdsman). For example, when considering

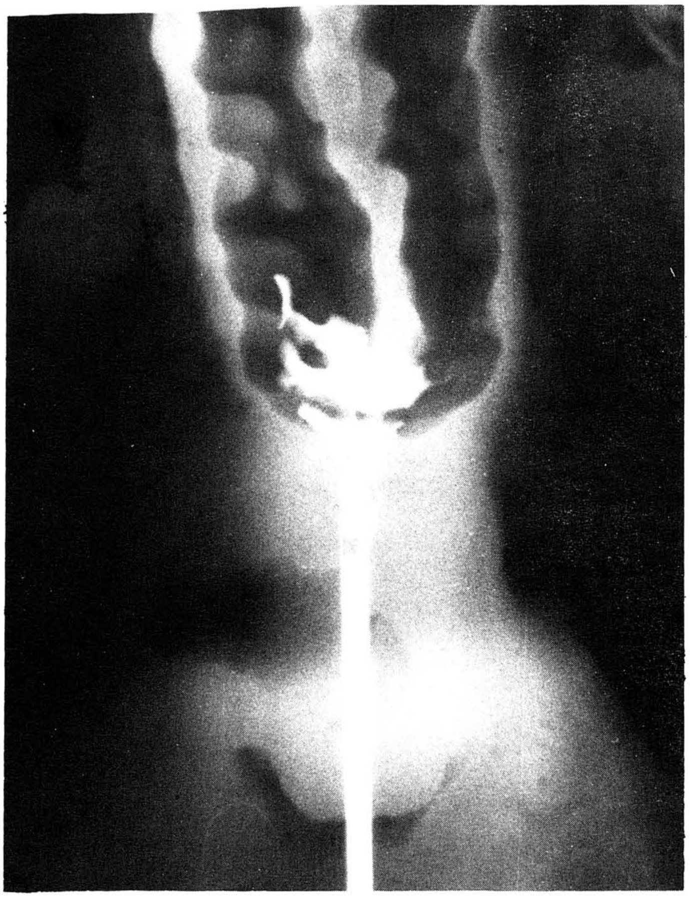

FIGURE 2. Radiopaque insemination after complete delivery from .5-ml French straw. (from Senger and Peters, 1983).

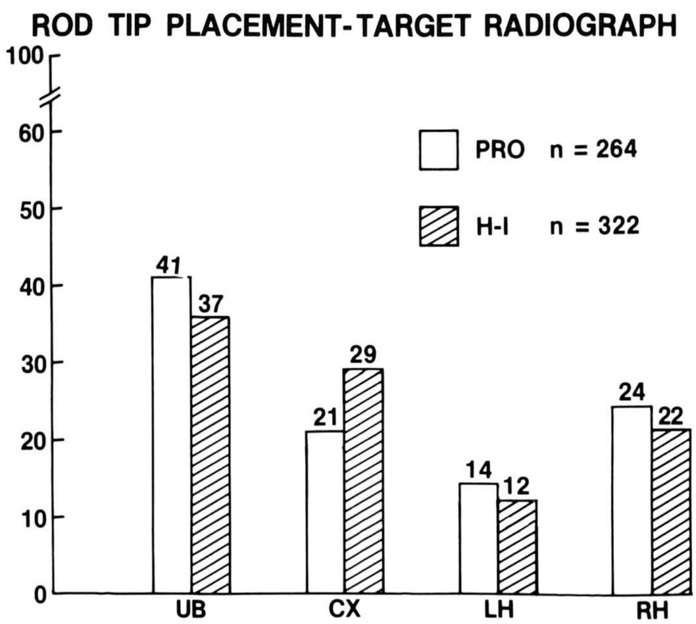

FIGURE 3. Mean percentage of rod tip placement (vertical axis) in specific anatomical regions of the bovine reproductive tract by professional (PRO) and herdsmen-inseminators (H-I). UB = Uterine Body; CX = Cervix; LH = Left Uterine horn; RH = Right Uterine Horn. (Senger et al., 1984).

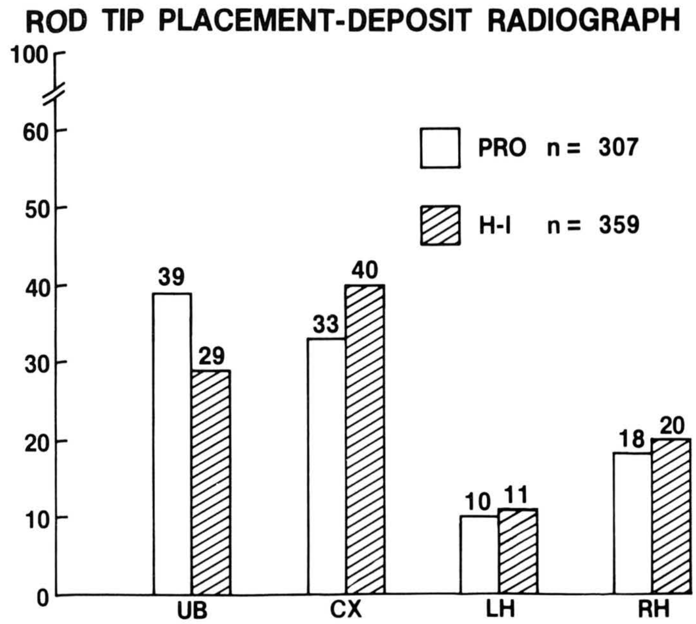

FIGURE 4. Mean percentage rod tip placements (vertical axis) after complete delivery of the inseminate (second radiograph). UB = Uterine Body; CX = Cervix; LH = Left Uterine Horn; RH = Right Uterine Horn. (Senger et al., 1984).

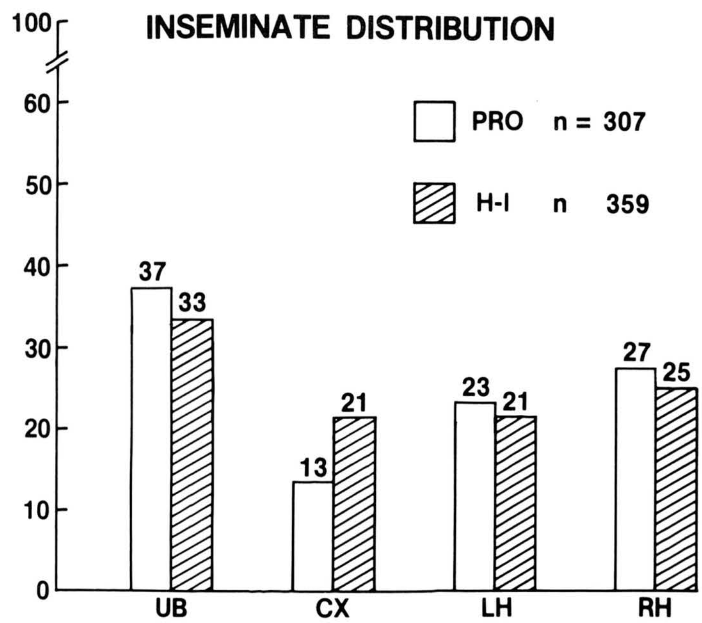

FIGURE 5. Mean percentage of radiopaque inseminate deposited in various regions (vertical axis) with the bovine reproductive tract by professional (PRO) and herdsmen-inseminators (H-I. UB = Uterine Body; CX = Cervix; LH = Left Uterine Horn; RH = Right Uterine Horn. (Senger et al., 1984).

the percentage of syringe tip placements in the uterine body, professionals ranged from 6 to 85% while herdsmen ranged from 0 to 82%. Less than half (39%) of the placement attempts by all inseminators were in the uterine body. The proportion of inseminators achieving syringe tip placement in the uterine body is presented in figure 3. Of the 40 inseminators, 33 (82.5%) were unable to place the syringe tip in the uterine body greater that 60% of the time.

It is clear that neither professionals nor herdsmen were able to consistently position the syringe tip in a defined anatomical region. The majority of the inseminators were trained to positon the syringe tip in the uterine body or the anterior annular fold of the cervix. However, about 36 percent of the placement attempts were positioned in the right or left uterine lumen.

Location of the syringe tip after deposition of semen describes the position of the syringe tip immediately after complete delivery of the radio paque inseminate. These data are presented in figure 4. There was no difference between professionals and herdsmen regarding the position of the syringe tip in various anatomical regions after semen delivery. For professionals, 6 to 80% of the time syringe tips remained in the uterine body after semen deposition. Herdsmen ranged from having 0 to 70% of their attempts remaining in the uterine body. There was an increased proportion of cervical placements after deposition (37%) when compared to the before deposition (25%), suggesting that the syringe was being pulled in a posterior direction during or at the completion of inseminate delivery.

Distribution of the inseminate after deposition is presented in figure 5. It is obvious that inseminate distribution was related to syringe tip placement. Correlation coefficients among syringe tip placement and location of the inseminate are as follows:

1. syringe tip placements in uterine body before deposition vs syringe tip placements in uterine body after deposition; r = .86.
2) syringe tip placements in uterine body in placement attempts vs percentage inseminate located in uterine body; r = .73.
3) syringe tip placements in uterine body vs percentage inseminate located in uterine body; r = .66.

These data suggest that more emphasis should be placed on identifying the correct anatomical region for placement of the syringe tip in training and retraining programs.

A recent study involving only herdsman-inseminators (Swain et al., 1987) corraborated the findings of Peters et al. (1984). Only 37 percent of insemination attempts were located in the uterine body (table 1). After retraining by extension agents 74 percent of the attempts were in uterine body (table 1). Unfortunately, the percentage of syringe tips in the crevix was not influenced by retraining.

On the average, retraining improved conception by 3.7 percent as judged from evaluation of 12,247 services by 39 herdsman-inseminators. After retraining, 25 individuals improved, 13 declined and one did not change. The mean improvement in conception was 10.1% and for those declining it was 8.4 percent.

A surprising finding of the study was that 17 percent of the participants did now know the correct site for seminal deposition.

Considering the repeated difficulty in uterine body deposition, other A.I. techniques need to be examined in an attempt to improve conception through improved insemination skill. In addition, routine programs (at least annually) for evaluation of A.I. skill using excised tracts should be conducted.

TABLE 1. Mean percentages of syringe tip placement in various anatomical regions before and after retaining.

Anatomical Region	Before retaining	After retaining	Percent change
Uterine body	36.9 (139)	73.7 (283)	+36.8*
Cervix	23.1 (87)	21.1 (81)	− 2.0
Left uterine lumen	15.8 (59)	3.4 (13)	−12.4*
Right uterine lumen	24.2 (91)	1.8 (7)	−22.4**
	n = 376	n = 384	

() Number of radiographs
* ($p < .02$)
**($p < .01$)
(From Swain et al., 1987)

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