Studies on Once-Daily Artificial Insemination Programs

Milton Wells and Glenden Adams

Story in Brief

Estrus and insemination records for the past two years were summarized to determine estrus incidence patterns and conception efficiency for cows and heifers in the O.S.U. dairy herd. These were then utilized to develop management recommendations for estrus detection programs and insemination practices relative to time of exhibition of estrus.

Estrus detection was accomplished with visual observation at 8 a.m., 1 p.m. and 5 p.m. with the aid of deviated bulls equipped with Chin-Ball markers. Animals observed at the 8 a.m. and 1 p.m. periods were inseminated in the evening between 4 p.m. and 5 p.m. Animals detected in heat at evening observation were inseminated either in a.m. or p.m. the following day.

Analysis of heat occurrence data revealed that 70 percent to 80 percent of heats will be detected at the 8 a.m. and 1 p.m. observations. Animals cycling in the p.m. conceived equally well whether inseminated the next morning or the following evening. It appears that performing the insemination chores once daily in the evening would be an efficient use of time with no decrease in conception efficiency.

Introduction

For quite a number of years, artificial insemination has been used successfully with efficiency apparently equivalent to natural service. It has been recommended almost universally that cows cycling in the morning be bred in the evening while those cycling in the evening be inseminated the next morning in order to achieve reasonable timing of insemination.

This recommendation is supported by data indicating that there is a fairly long period of time in the estrus period where normal conception efficiency can be expected. Very early breeding or breeding several hours after estrus is over has been thought to contribute to lowered conception efficiency.

Data accumulated in the past few years indicated that dairy cattle do not cycle in a random fashion throughout the day. Data from Canada, Louisiana, California, Kentucky and Oklahoma indicate that 60 to 65 percent of the cows will exhibit heat beginning in the very early hours of the morning up until 8 or 9 a.m.

There have been very few attempts to try to design an insemination program around the heat exhibition pattern. Some limited research as well as uncontrolled field data indicate that once-daily insemination programs may be more acceptable than we have thought for several years.

Methods and Materials

Our research plan was devised to yield information in two basic areas. The first objective was to continue study of the distribution of heats during the 24 hr period. This was important from the standpoint that if the majority of cycling did concentrate in the early morning hours it would dictate an insemination pattern for a once-a-day format. The second objective was to compare the conception efficiency to once-daily inseminations versus twice-daily inseminations.

Our research included heat observations on 492 animals and heat and conception data on 90 heifers and 104 cows. The overall research approach was the same for both heifers and cows. The animals were randomly assigned within breed to one of two study groups.

Group I was subjected to the following insemination pattern: animals cycling in the a.m. and up to 1 p.m. were bred between 3 and 6 p.m. on the same day; animals cycling after 1 p.m. were bred in the p.m. of the following day.

Group 2 animals were designated as our control group and were bred in the traditional format. Animals cycling in the a.m. were bred in the p.m. of the same day while animals cycling in the p.m. were bred in the a.m. of the next day.

Heat detection was accomplished by using deflected bulls equipped with Chin-Ball markers being present in the groups at all times, as well as visual detection three times daily.

Results and Discussion

The results of the heifer study were shown in Table 1. Forty-four heifers were assigned to receive the once-a-day insemination while 46 heifers were to be the controls. In both groups, the high percentage of the first heats observed following the initiation of the study did occur in the a.m. The same pattern held true for the total number of heats exhibited during the breeding program with approximately 75 percent of the heats occurring in the a.m.

It should be realized that this is influenced by the fact that this includes the time period up to 1 p.m. each day rather than the 8 or 9 a.m. which would be typical with twice-daily heat detection.

Conception efficiency in the heifer groups for 1977 is compared in Table 1. The a.m. cycling heifers in both groups conceived in a very similar pattern, requiring 1.68 and 1.72 services per conception, respectively. The p.m. heifers also conceived very similarly, regardless of whether the p.m. cycling heifers were bred the following morning or the p.m. of the following day.

Table 1 also lists the open heifers in each insemination program. The number of open heifers could not be clearly attributed to treatment. Inspection of the data suggested that low bull fertility in two breeds may have contributed to the number of open heifers.

Table 1. Heat and conception data -- heifers, 1977.

Item	IX-44 Heifers		2X-46 Heifers	
	AM	PM	AM	PM
1st Heats	30 (68%)	14 (32%)	35 (76%)	11 (24%)
Total Inseminations	47 (73%)	17 (27%)	55 (74%)	19.(26%)
Total Conceptions	28	9	32	10
Services/conceptions	1.68	1.89	1.72	1.90
Conception Rate	59.6%	52.9%	58.9%	52.6%
Open Heifers	2	5	3	1

The heifer data strongly suggests that this type of once-a-day insemination program would impose no penalty on conception efficiency. Although this deviates from the recommendations of previous years, it would appear that it makes little difference whether a p.m. cycling heifer is bred the following morning or the p.m. of the next day.

Table 2 summarizes the results of the study on cows. There were 55 cows in Group 1, which were bred on the once-daily insemination program. There were 49 cows in Group 2 which were bred according to traditional programs. The vast majority of the heats occurred in the a.m. observation period with approximately 80-85 percent of the heats in the cows occurring at the a.m. observation.

Conception data is also presented in Table 2. Conceptions to the a.m. heats were similar for cows bred either twice-daily or once-daily with about 1.5 services required for conception for cows in heat in the a.m. For Group 1, cows cycling in the p.m. and bred the following p.m. required 1.57 services per conception. For Group 2, where the p.m. cows were bred the following a.m., the services required per conception were 1.63.

This data again indicates that it makes little difference whether the p.m. cycling cows are bred the following morning or the afternoon the following day.

Table 3 combines all the data of both cows and heifers. For almost 200 animals, the data strongly indicates that dairy animals can characteristically be expected to be observed in heat predominantly in the morning hours.

Table 2. Heat and conception data --cows, 1977.

Item	1X-55 Cows AM	1X-55 Cows PM	2X-49 Cows AM	2X-49 Cows PM
1st Heats	46	9	40	9
Total Inseminations	68	11	59	13
Total Conceptions	45	7	40	8
Services/Conceptions	1.51	1.57	1.48	1.63
Conception Rate	66%	64%	67%	62%

Table 3. Heat and conception data -- all heifers and cows, 1977.

Item	1X-99 Animals AM	1X-99 Animals PM	2X Animals AM	2X Animals PM
Total Animals	76	23	75	20
Total Inseminations	115	28	114	32
Total Conceptions	73	16	72	18
Services/Conception	1.57	1.75	1.58	1.78
Conception Rate	63%	47%	63%	56%

Table 4. Recycling patterns on 492 heats, 1977 and 1978.

Pattern	No. Heats	%	%
a.m. - a.m.	307	62	67
p.m. - p.m.	22	5	
a.m. - p.m.	66	13	
p.m. - a.m.	97	20	33

It could be argued that this is a function of our observation times rather than a reflection of the true cycling pattern of the cows. Companion data from Canadian studies indicate that cows truly do come into heat predominantly in the a.m.

Little data is published on whether an animal will exhibit recurring heats in the same part of the day. Table 4 summarizes data on 492 recurring heats. Of these heats, 67 percent were exhibited in the same part of the day as the previous heat, that is, an a.m. -a.m. or p.m. -p.m. pattern.

The balance of the heats, 33 percent, were exhibited in the opposite pattern, that is, a.m. -p.m. or p.m. -a.m. This strengthens our recommendation that extensive morning heat observations are most critical for excellent heat detection programs.

On a practical management viewpoint, there could be little doubt that a big percentage of the cows can be found in heat by observing up to 1 p.m. each day. Our data also strongly suggests that these animals can be efficiently inseminated by breeding them at 3 to 5 p.m. in the afternoon, and that a.m. cycling animals may conceive more efficiently than p.m. cycling animals.

If true, this is likely a function of timing and suggests that insemination early in the heat period may not be as big a penalty as has been thought. Although the total number of animals cycling in the p.m. is limited, there is a strong indication that it makes little difference whether p.m. cycling cows are bred the following morning or in the afternoon of the following day.

At first inspection, this may seem contrary to insemination recommendations that have been made for years. However, if we examine the time line in Figure 1, it becomes quite apparent that a.m. cycling cows are bred essentially from mid to late cycle while p.m. cycling cows bred the following p.m. are bred toward the very end of the expected standing heat period.

When this fact is realized, then it is not surprising that p.m. cycling cows bred the following p.m. should not be suffering any penalty in terms of conception efficiency. It should also be realized that p.m. cycling cows bred the following p.m. will still be inseminated several hours prior to ovulation. Our results suggest that the time period is adequate for sperm cells to be prepared for fertilization.

More studies need to be conducted on this, but we have little hesitancy at the moment in recommending once-a-day insemination as defined in this study.

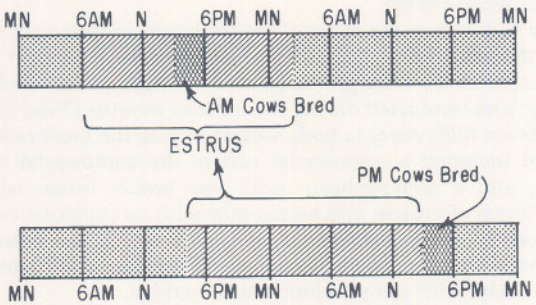

Figure 1. Once a day insemination.