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Reproductive Efficiency of Dairy Cattle as Influenced by Post-partum Breeding Interval and Gestation Number

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Reproductive Efficiency of Dairy Cattle as Influenced by Post-partum Breeding Interval and Gestation Number

Breeding back too soon after a cow calved was one of the most common faults of managements reported by Asdell (1955). A mobile laboratory unit in New York State observed this practice among dairymen and recommended that 60 days post-partum was soon enough for the first service and that the animal should be bred only if she had cleaned properly. Earlier breeding gave a lower percentage of success.

Van Demark and Salisbury (1950) reported that cows first bred within 20 days after calving required an average of 2.86 services per conception. Thus only 35 percent of the services resulted in conception. The average fertility level of the cows increased with each additional 20 day interval, with a maximum number of services resulting in conception in those cows first bred 101-120 days after calving. When cows were not bred until 200 or more days after calving, a slightly greater number of services per conception were required.

Breeding a cow to conceive 75 to 110 days after calving results in the greatest average daily milk production for the lactation period, according to Petersen (1950). Breeding earlier than the 75th day results in a reduction in milk yield. Breeding for conception on the 30th day following calving causes a reduction in the milk yield of 18.4 percent for heifers and 21.3 percent for older cows, while the calving interval is shortened by only 15.1 percent. When more than 110 days intervene between calving and conception, the percentage increase in the length of time between calvings becomes greater than the increased milk yield, resulting in lower average daily yields. By breeding cows on the first heat period following the 75th day after calving it is possible to secure pregnancies for all but a small percentage of a normal breeding herd by the 110th day following calving.

Results of an experiment conducted by Trimberger (1954) showed that when the first service was 50 days or less after parturition, the number of services per conception averaged 2.52. While the average time from parturition to first service was only 40.9 days for cows bred 50 days or less post-partum, the actual average days from parturition to conception was 100.5. This was a longer interval than the 74.5 days for the cows first bred from 51-60 days post-partum. No difference was found in the number of cases of abortions, retained placentae, and metritis between the group with short or long post-partum intervals to first service when there was good genital health in the cows. However, for good reproductive performance, the first service should be over 50 days post-partum for normal cows with good genital health. Also, if the service was within 60 days

after parturition, cows with a previous estrus had a much higher rate of conception than those not having had an estrus period before the one at which service occurred.

Shannon *et al.* (1952) observed that 52.5 percent of 1062 cows bred apparently conceived when the first insemination occurred 51-60 days post-partum. There was no significant difference between the group of cows bred 51-60 days post-partum and those bred 61-80 days. When cows which were inseminated within 50 days after calving and did not conceive on first service were inseminated the second time, 43 percent conceived. From these data there was no indication that fertility increases with the length of the interval from calving to first insemination, provided that a minimum of 50 days from calving to insemination was observed. In the interval of 41-50 days after calving of 678 cows inseminated, 70.6 percent conceived on a maximum of two services; whereas, in the 51-60 day time interval after calving of 1062 cows inseminated, 76.0 percent conceived with a maximum of two inseminations. Since a lowered conception rate is shown for both first and second inseminations, an interval of less than 50 days from calving to insemination is not to be recommended.

A worker in Israel, H. Schindler (1955), reports that an interval of more than two months post-partum before breeding would be advantageous for herd owners. Poor genital health of many cows was shown by their low breeding efficiency. In 14 herds the conception rate of cows was 29.5 percent, and of heifers, 53.5 percent. Only about 60.0 percent of non-conceiving cows returned to service in less than 30 days. Schindler assumed that this delay was caused by abnormal estrus cycles and other disorders of the genital organs, or by early embryonic mortality.

From these foregoing reports, the time interval from parturition to first service is of importance and must be considered by herdsmen. This time-interval is determined, to a large extent, by the involution of the uterus. Buch *et al.* (1955) reported that the average interval from parturition to involution was 47 days with an interval of 33 days between parturition and first heat. There was a significant difference between primiparous (42 days) and pluriparous (50 days) cows in the involution interval. It was noted that cows calving during the summer tended to come in heat earlier than those calving in other seasons; whereas, those calving during winter had the longest intervals from parturition to first heat. Examination of cows at the end of different intervals after calving showed that 95.0 percent or more of the cows in heat had their uteri involuted after an interval of 90 days. A study of 71 abnormal calvings indicated a slightly longer interval (5 days) to involution than for cows calving normally. The primiparous cows in this group also showed involuted uteri earlier than did the pluriparous cows.

Trimberger (1956) found that the average number of days from parturition to first estrus was 50.9 days for a control group and 49.4 days for the experimental group. When the intervals of estrus were considered, it was found that

60.4 percent of the intervals were between 18 and 25 days. A total of 37.4 percent of the intervals were over 25 days and 2.2 percent were less than 18 days.

Data presented by Herman (1956), as furnished by artificial insemination organizations, indicated that there was no significant difference in the fertility of virgin heifers and cows that were in their peak production years. Cattle, all ages (794,221) had a first service 60-90 day non-return of 72.12 percent with a range of 65.7 to 75.5 percent. The non-return rate for virgin heifers (198,555) was 70.11 percent; cows (476,333) under 8 years, 73.22 percent; and cows (119,133) over 8 years, 68.7 percent.

During the past ten years, many improvements in handling semen have been made and more experienced inseminators are available, thus making for better conception rates. Tanabe and Salisbury (1946) reported that records of the New York Artificial Breeders' Cooperative for registered Holstein-Friesian cows showed the average number of services required per conception was 2.07, or a breeding efficiency of 48.2 percent. There was a steady increase in the conception rate up to four years of age. Between the ages of five to seven years inclusive, cows maintained a uniformly high breeding efficiency, which gradually declined with advancing age.

The time of breeding is one of the basic physiological principles that must be observed to obtain efficiency in artificial breeding, as stated by Herrick (1957). He observed that the intervals between heat periods varied from 18 to 25 days. Data from Moeller and Van Demark (1951) indicated that an increase of approximately 20 percent in the number of cows settled at any one estrus can be obtained when all cows are inseminated, regardless of the interval at which they return from a previous insemination. This increase is above that obtained when only those cows are bred which return between 18 and 25 days. They found that only the fertility of those cows that returned within 2 to 17 days differed significantly from the mean fertility level.

Management is the most important factor concerned with getting cows settled at the proper time. Rennie (1956) observed that with records of 22 cows, the first observed estrus occurred 55 days after parturition, with a standard deviation of 29 days. There was an average interval of 26 days from the time of the first estrus until first breeding.

Another factor which should not be overlooked in breeding efficiency is production of the cow. Laben *et al.* (1956) have advanced this hypothesis: Cows with high milk yield genotypes might be under greater internal stress than low producers and therefore exhibit an increased length of reproductive cycle. Their studies showed that high producers tended to take slightly longer to settle.

METHODS

A study was made of the reproductive records of Holstein, Jersey, and Guernsey cows in the University dairy herd, 1934 to 1955. Information on ani-

mals bred for the first lactation was excluded from this study because of incomplete records on initial heat dates. The study includes records on the first six heat dates of 515 cows with 1,899 services and 1,233 calvings.

The records were divided into groups with a 15-day interval between groups. As reported by Edmondson (1950), the average length of time from parturition to the first estrus was approximately 57 days. The first interval used was that in which cows were noted in estrus less than 56 days post-partum. The next six intervals considered were 15 days later in each case; the last interval contained those records where estrus occurred after 130 days. The days from calving to the occurrence of the first estrus and all successive estrus periods were calculated for each parturition.

Each cow was observed for heat when the cows left the milking barn. Any cow in heat was retained in the barn for at least 24 hours. All heat dates were recorded in a permanent card file. The general practice has been to breed a cow when there has been an interval of 60 days following calving except when cows were on official test and were milked three times a day for 365 days.

RESULTS AND DISCUSSION

When all first service calving records were considered, the calving percentages indicated a maximum calving rate for the first heat period with successively lower calving percentages for those cows bred during the second and third heat periods (Table 1). The effect of age on the first service calving rate on the

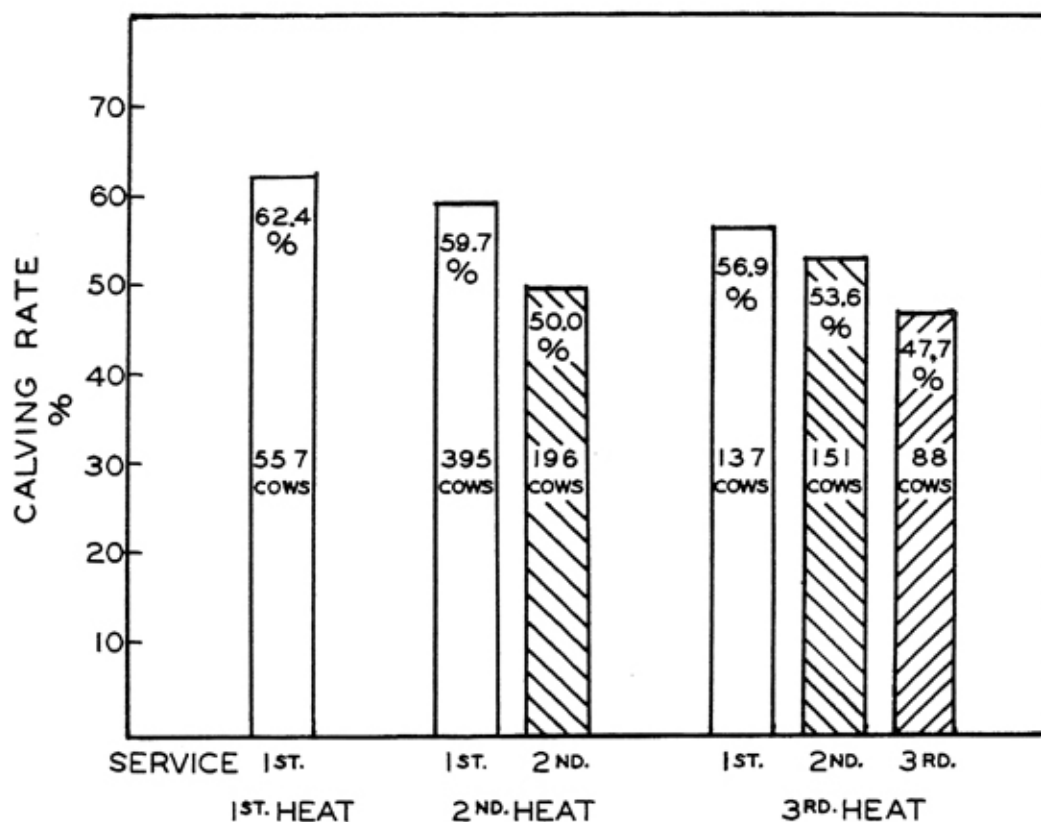
TABLE 1. FIRST SERVICE CALVING RATE OF COWS BRED FOR THE SECOND TO SEVENTH CALF; COMBINED AVERAGE FOR GUERNSEY, HOLSTEIN, AND JERSEY COWS.

Cows bred for Calf No.	1st Heat		2nd Heat		3rd Heat		Average
	No. bred	Calving rate %	No. bred	Calving rate %	No. bred	Calving rate %	Calving rate %
2	179	68.7	149	60.4	59	64.4	64.9
3	149	62.4	101	64.3	24	58.3	62.8
4	91	68.1	55	67.3	28	50.0	64.9
5	63	50.8	48	54.2	13	53.8	52.4
6	48	55.1	27	48.1	6	33.3	52.4
7	27	40.7	15	33.3	7	42.9	40.0
Total bred	557		395		137		
Avg. Calving %		62.4		59.7		56.9	60.8

cows in this study becomes evident after the fourth calf, with the average calving rate for all three heat periods declining to 52.4 percent for cows bred for calf Nos. 5 and 6, and reaching a low of 40.0 percent for cows bred for calf No. 7.

Figure 1 also illustrates the decreases in calving percentage from first through the third heat period. In addition, it shows a decline in calving percentages for those that failed to calve from service during the preceding heat period.

Fig. 1—Reproductive efficiency (calving percentage) of cows bred at first, second, and/or third heat periods. Combined average for Guernsey, Holstein, and Jersey cows.



The effect of post-partum breeding interval on first service calving rate for cows bred during the first three heat periods is shown in Table 2. This table indicates an apparent optimum post-partum breeding interval of 71 to 100 days,

TABLE 2. EFFECT OF POST-PARTUM BREEDING INTERVAL ON FIRST SERVICE CALVING RATE OF COWS BRED DURING THE FIRST THREE HEAT PERIODS; COMBINED AVERAGE OF GUERNSEY, HOLSTEIN, AND JERSEY COWS.

		Post-Partum Breeding Interval in Days							
		Less Than	56-70	71-85	86-100	101-115	116-130	Over	Average
First Service		56						130	
1st	No. Bred	126	184	109	44	34	17	43	
Heat	Calving %	63.5	59.8	66.9	59.0	67.6	52.9	62.8	62.4
2nd	No. Bred	52	134	73	52	26	26	32	
Heat	Calving %	46.1	58.9	63.0	69.2	61.5	61.5	59.4	59.7
3rd	No. Bred	9	29	27	13	8	12	39	
Heat	Calving %	22.2	58.6	62.9	46.1	37.5	66.7	64.1	56.9
Total Bred		187	347	209	109	68	55	114	
Avg. Calving %		56.6	59.3	65.0	62.4	61.7	60.0	62.2	60.8

regardless of whether the cow is bred during the first, second, or third heat period. However, the first heat calving percentages are generally above those for the other heat periods. When the effect of post-partum breeding interval in days is compared on the basis of calving number, as shown in Table 3, it seems ap-

TABLE 3. EFFECT OF POST-PARTUM BREEDING INTERVAL ON CALVING RATE OF COWS BRED FOR THE SECOND TO SEVENTH CALF; COMBINED AVERAGES OF GUERNSEY, HOLSTEIN, AND JERSEY COWS BRED ONE - THREE TIMES DURING FIRST THREE HEAT PERIODS.

For Calf No.	1 - 3 Services	Post-Partum Breeding Interval in Days							Average
		Less Than 56	56-70	71-85	86-100	101-115	116-130	Over 130	
2	No. Bred	42	131	74	77	50	50	95	60.9
	Calving %	60.5	63.4	60.8	57.1	58.0	58.0	64.2	
3	No. Bred	60	94	88	51	40	12	38	60.0
	Calving %	70.0	55.3	64.8	56.9	57.5	58.3	52.6	
4	No. Bred	33	65	33	25	21	13	41	64.5
	Calving %	54.5	70.8	66.7	52.0	66.7	69.2	65.9	
5	No. Bred	26	36	33	24	20	10	38	52.4
	Calving %	42.3	47.2	66.7	54.2	55.0	50.0	50.0	
6	No. Bred	16	29	20	17	12	6	25	48.0
	Calving %	37.5	44.8	60.0	52.9	41.7	83.3	40.0	
7	No. Bred	10	18	18	10	10	3	12	37.5
	Calving %	30.0	27.8	44.4	30.0	50.0	33.3	33.3	
Total Bred		187	373	266	204	153	94	249	
Avg. Calving %		56.6	57.9	63.2	54.4	56.9	59.6	56.6	57.3

parent that a 71-85 day time-lapse between calving and breeding becomes particularly important for older cows, notably those which are bred for the fifth through the seventh calf. Calving percentages for post-partum breeding intervals, other than 71 to 85 days, are considerably lower than for this apparent optimum interval.

Records of the different breeds of animals indicated no essential difference in reproductive efficiency. First service calving records for the Holsteins, Jerseys, and Guernseys were 62.4, 61.4, and 64.5 percent, respectively. Calving percentages for three services were 55.7 percent for Holsteins, 61.8 for Jerseys, and 62.4 for Guernseys. The calving percentages for all services, all heats (1-6) for these three breeds were Holsteins 54.4, Jerseys 61.8, and Guernseys 60.1. Considering all breeds, 80.74% of the cows calved from three services or less. These data suggest that a more rigid culling program has been followed for breeding efficiency in the case of Guernsey and Jersey animals. However, they represented, proportionately, a much smaller number of animals than the Holstein breed.

Both age and post-partum breeding affected reproductive efficiency, either in days or in heat "number." However, the study is subject to a number of biases in that cows showing abnormalities of any kind at time of heat were held open. First heat calving percentages are probably higher in proportion than others because of this managerial factor. The true magnitude of the effect of age is not shown because only the better reproducing cows remained in the herd to have a

larger number of calves. As a result of these biases, more importance probably should be attached to the days post-partum breeding interval than to the effect of breeding at first heat period. This post-partum breeding interval apparently becomes increasingly important for cows that remain in the herd for long periods of time.

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SUMMARY

Reproductive records of Holstein, Jersey, and Guernsey cows were studied. The optimum post-partum time to breed reproductively normal dairy cows according to these records, would be either the first heat or 70-85 days after calving. The post-partum breeding interval appeared particularly important for older cows, after the fourth calf.

The average calving rate from one to three services declined from approximately 60 percent for the second, third, or fourth calf, to 37.5 percent for the seventh calf, indicating a rather pronounced effect related to age.

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