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Tohoku Journal of Agricultural Research
Vol. 22, No. 3, October 1971
Printed in Japan

Influence of Uterine Irrigation Soon after Parturition on the Fertility in Dairy Cattle

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(Received, August, 26, 1971)

Summary

The calving interval affects considerably the lifetime production of cattle. Thus, the shortening of the intervals from parturition to estrus and conception is claimed for the elevation of yield. Generally subestrus and silent-heart occur at an early stage following calving. Thus, the postpartum breeding and the calving interval are delayed. It has been observed that the intrauterine irrigation in the anestrus and subestrus cattle promotes the estrus which often results in gestation. The authors have attempted to shorten the interval from parturition to estrus and conception by treatment of uterine irrigation.

The uterine irrigation was carried at three weeks after calving. The fluid used was 20 percent calcium borogluconate solution. The fluid infused was 400 to 1000 ml.

The estrus occured within 41.4 days following calving in almost all cases, excepting the endometritis. The intervals from parturition to conception were 50.8 days. The shortening of the intervals from parturition to estrus and conception seemed to be relate to the uterine involution and uterine stimulation. Then, the mechanism of the uterine irrigation as a mean of promoting estrus and conception is discussed.

There is little doubt that shorter calving intervals result in higher average milk production per day during the calving interval (1, 2). The calving intervals may be effectively shortened by breeding sooner after calving or by accomplishing conception at an early service or both. On the other hand, it has been commonly believed and well publicized that breeding cows at less than 60 days after calving results in low conception rates and a multitude of undesirable problems. However, these opinions were extremely doubtful, because no study has been made of the causes of postpartum infertility and the occurrence or persistence of the possible harmful effects from early breeding. Recently, results of a study in clinically normal cows indicated that breeding cows at less than 60 days after calving is the most effective means available to a dairyman for shortening calving intervals (3). It was recognized that one of the common difficulties in postpartum

breeding is that some cattle cannot be mated because either they do not come into estrus or do not give any sign that they are in estrus, in spite of the occurence of ovulation. It is expected that if the lost days due to undetected estrus period or silent heat could be presented by producing visible signs of estrus and if estrus could be induced twice within 60 days postpartum, the conception rates would be much higher and the calving intervals shorten. The authors have previously attempted to shorten the intervals from parturition to estrus by treatment of gestagen and estrogen (4). The results have indicated that the reduction of average length from calving to estrus, ovulation and uterine involution, but did result in a lower conception rate.

It has been recognized that the intrauterine irrigation in the anestrus and subestrus cattles or mares is finding increasing favour as a means of promoting estrus which often results in pregnancy (5–7). The present experiment was undertaken to investigate whether the estrus accompanying ovulation could be induced by intrauterine infusion soon after parturition and the higher conception rate could be obtained.

Experimental procedure

This investigation was conducted on animals maintained at the Experimental Farm of Tohoku University at Kawatabi. Sixteen cattles of the Holstein breed were used. Their calving number ranged from 2 to 8. They had more than one calving interval and were in good bodily condition. All cows had access to pasture from May to October and were kept under dry lot conditions from November to April. Some concentrate was supplemented during the summer. The winter ration consisted of concentrate and hay or hay and silage. All animals were milked twice a day.

The experiment was run from March 1st, 1970 until April 30th, 1971. Uterine irrigation was carried out 3 weeks after parturition. The fluid infused was 20 per cent calcium borogluconate solution at body temperature. The quantity of fluid varied between 400 and 1000 ml. The fluid was introduced through the cervix into the uterus by means of a catheter and a syringe. A hand was inserted into the cows rectum to assist guidance of the catheter through the cervix until it projected well into the uterine body.

A daily test for estrus was made in all cows, beginning 7 days following parturition. Determination of the estrus implied careful observation of the behaivor of the cow and a mucous discharge from the vagina 2 or more times daily. All cows were bred from first estrus after parturition. The breeding was accomplished by artificial insemination or hand mating. A weekly rectal palpation was performed for examination of the ovaries, uterus and cervix, starting the second week after parturition and continued to conception. The uterine involution was recognized when it returned to its normal position and the two horns were similar

in diameter, showing normal consistency and tone. The results of interval from calving to conception obtained in the present experiment were comparable to the previous records of reproduction in the same animals.

Results

The results obtained in the present investigation are shown in Table 1. Presumably there are some ovulations that occur without any expression of estrus or with subestrus. On the other hand, the first estrus was not always accompanied with ovulation. In some cattle, the developed follicle led to atresia and failed to ovulate. So, first estrus refers only to those cases which also are ovulation and first ovulation refers to the first ovulation postpartum, whether or not it is accompanied by estrus. The intervals from parturition to first estrus ranged from 20 to 70 days, averaging 41.1±14.8 (S.D.) days. The intervals from calving to first ovulation ranged from 20 to 68 days, averaging 37.4±13.0 days. The estrus and ovulation did not occur before the treatment of uterine irrigation. Thus, the estrus after calving occurred almost always within 20.4 days of uterine irrigation.

There were 11 cases in which ovulation at the first estrus occurred in the ovary on the previously nonpregnant side and 6 cases in which ovulation occurred on the pregnant side.

The intervals from parturition to uterine involution ranged from 25 to 45 days, averaging 32.1±5.5 days. Rectal evaluation of the uterus 25–35 days postpartum revealed complete involution though it was still thickened. At 4–5 weeks postpartum the uterus of some cows contained exudate. Although no large amount, it appeared to have delayed involution to some extent.

The intervals from parturition to occurrence of conception ranged from 26 to 70 days, averaging 50.8±16.3 days. Some cows did not conceive within 70 days after calving. These three cows (No. 931, 903, 828) exhibited an endometritis condition. There were 7 cases in which conception occurred in the uterine horn on the previously nonpregnant side and 6 cases in which conception occurred on the pregnant side.

The intervals from parturition to conception in the present experiment are comparable with the results obtained in the previous postpartum of the same cattle (Table 1). In the previous postpartum, the artificial insemination was similarly conducted from the first estrus after calving. The intervals from parturition to conception in previous post-calving ranged from 35 to 309 days. A significant effect of uterine irrigation on the fertility after calving was recognized from the comparison of these both results.

Discussion

A recent bulletin summarized data from various investigations of dairy cows

TABLE 1. *Times of Parturition, Estrus, Uterine Involution and Conception*

No. of cattle	Calving number	Calving period	Intervals from parturition to (days)				Side of pregravid horn	Intervals from parturition to conception at previous calving (days)	Remarks
			First estrus	Second estrus	Third estrus	Uterine involution			
907	4	3.11.1970	(35)R.*			30	right	125	
960	2	3.21	30 S.R.	(69)L.		30	〃	114	
958	2	5.29	30 S.R.	(70)R.		25	left	172	
931[1)]	3	6.4	26 R.	72 S.L.	101 L.	45	〃	180	1) endometritis; second uterine irrigation on 11.28, 1970; conception at 177 days after calving.
961[2)]	2	6.28	28 A.	55 L.	70 A.	28	right	138	
975	2	8.8	47 L.	(66)R.		32	〃	214	
924	4	8.12	(26)R.			30	〃	53	
925	3	9.24	28 L.	49 S.L.	(69)R.	29	right	[85]	2) second uterine irrigation on 11.24, 1970; conception at 157 days after calving.
979	2	10.13	(30)L.			25	〃	309	
903[3)]	4	12.7	28 S.A.	52 L.	92 L.	42	left	247	
989	2	12.13	33 A.	(51)L.		30	right	[214]	3) endometritis; under treatment
870	6	1.6.1971	22 A.	48 A.	(68)R.	30	〃	113	4) endometritis; under treatment
907	5	1.23	20 L.	(40)L.		35	〃	35	
828[4)]	8	1.24	25 A.	35 L.	45 R.	–	〃	152	
898	5	2.2	28 S.R.	(36)R.		36	left	[272]	
886	6	3.4	32 L.	(50)L.		35	right	[205]	
980	2	3.13	32 S.A.	43 R.	(51)R.	32	〃	[248]	

* R.L. - right or left in ovulation side of ovary ( ) conception S. - silent heat
[ ] - used in previous experiment of treatment of gestagen and estogen A. - anovulation

has indicated that the intervals from parturition to estrus ranged from 30 to 70 days (8). The authors have reduced the intervals from calving to estrus by treatment of gestagen and estrogen in dairy cows in a previous experiment (4). The present experiment indicated that the cows came into heat 41.4 days after calving. The average length obtained was also shorter than the length found in the previous studies (8). The estrus after calving occurred in the majority of the animals within 20.4 days after uterine irrigation. This result is the same as the observation on the anestrus cattle (7). It seemed that uterine irrigation has a estrus promoting effect in the early period following parturition similar to the results obtained in anestrus or subestrus cows (7).

Same bulletin indicated also that dairy cows first ovulate at 20 to 45 days after parturition and that the uterine involution is completed by 26 to 50 days after calving (8). The present research indicated that the intervals from calving to ovulation ranged from 20 to 68 days. The promoting effect of uterine irrigation on the occurrence of ovulation after calving was not observed. The interval from calving to uterine involution was 32.1 days in the present investigation. It has been reported that endometritis delayed the uterine involution (9). If the 3 cows having endometritis were removed, the average length is shortened to 30.5 days. The intervals from calving to uterine involution seemed to be reduced by the uterine irrigation.

The development of follicle was observed at very early period after parturition, but the first developed follicle led to atresia and failed to ovulation in some cattle. The first development of follicle and ovulation was most likely to occur on the ovary opposite to the side of the previous pregnancy and that the conception rates were better when this happened. The results are similar to the observations obtained by Saiduddin et al (10), and Foote et al (11).

The interval from calving to conception was 50.8 days, except for the four cattle (No. 961, 931, 903, 828). Two of these cows were later treated with uterine irrigation and conceived 157 and 177 days after calving. It has been recognized that the uterine irrigation has a shortening effect on the interval from calving to conception, when compared with the record of previous postpartum in the same cows.

This period following parturition was divided into 3 intervals (1 to 30, 31 to 60, 61 and over) to study the relative incidence of conception as affected by intervals. During the first interval two cows conceived. During the second interval six cows conceived. During the third interval five cows conceived.

Among the 13 bred at these times, 6 and 7 conceived with 1 and 2 service, respectively. There appears to be no difference in the conception rate according intervals from calving to estrus. The number of services per conception also did not show a difference as the interval from calving to breeding increased.

The present investigation indicated that the breeding of cows within 60 days

which had a previous estrus period after calving did not result in low conception rates. Cow No. 907 was continuously treated with uterine irrigation in two years and conceived at 35, 40 days after calving, respectively. There were not the multitude of undesirable problems as in the previously reported experiment (12, 13).

Normally, the development of the follicles and the occcurrence of ovulation are observed soon after calving. So fertility during postpartum seems to be based primarily on two processes; the involution of the uterus and the recurrence of estrus. On the other hand, there is no relation between involutionary status of the uterus and fertility in normal cows (9, 14). However, it is suggested that the lower fertility at early estrus after calving seemes to be due mainly to the lack of fertilization and that failure in spermatozoa transport and the infertile state of spermatozoa in the fertilization site are regarded as important factors (8). The authors have previously indicated that the uterine and oviductal environment in postpartum may have an adverse effect on the transport of spermatozoa, even though rats breed immediately after parturition (15). Further, it has been reported that the recurrence of estrus after calving may be dependent on the rate at which uterine involution occurs and the occurrence of estrus is late as uterine involution is delayed (16).

The mechanism of the uterine irrigation as a means of producing estrus in the cow is unknown. The role of the uterus on the regulation of ovarian function has received careful attention in recent years. It has been reported that the distension of the uterus of the cow by the insertion of a foreign body modifies the length of the estrus cycle (17, 18, 19, 20). Also early works have indicated that uterine irrigation and inflammatory changes in the uterus stimulated the onset of estrus. Thus the irritation of the uterus may be a more important component than the distention (18, 21, 22, 23).

It has been reported that the uterine stimulation does result in an increased output of oxytocin in the cow (24) and the oxytocin appears to influence the secretion of gonadotropins other than LTH (25, 26).

Johanns et al have indicated that 85 percent of the bovine uteri contained bacterial flora soon after parturition and 5 percent at 55 days postpartum (16). Then it is probable that the uterine irrigation with a large quantity of calcium borogluconate solution after calving may result in the evacuation of excess cellular and noncellular components which constitute limiting factors for the transport of spermatozoa in the female genital tract, a decrease of pus in the uterus and an acceleration of uterine involution accompanied with regeneration of the epithelium, and thus an establishment of estrus and conception at an early period after calving.

Birth is not an aseptic process. It seems very likely that during this process the flora of the vagina may be inoculate into the uterus. The antibiotic therapy is expected to have limited success in reducing the intervals from calving to

conception. For this reason an antibiotic substance will be added to the uterine irrigation in future experiments.

The authors wish to acknowledge the valuable technical assistance of Mr. A. Nihei and Miss. Y. Okazaki.

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