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THE POSTPARTUM REPRODUCTIVE STATUS OF DAIRY COWS IN TWO AREAS IN ICELAND*

By

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ELDON, JÓN and THORSTEINN ÓLAFSSON: *The postpartum reproductive status of dairy cows in two areas in Iceland.* Acta vet. scand. 1986, 27, 421—439. — The paper describes the postpartum (pp) reproductive performance of 252 dairy cows in 2 areas in Iceland, in the north (Eyjafjörður) and in the south (Skeið), during a 12 months period.

First pp ovulation occurred significantly earlier in primiparous cows, in cows in Skeið and in cows that calved in September—November.

The average time of first pp artificial insemination (ai) was 72 days in both areas. Conception rate to first ai in these cows was 58 % in Eyjafjörður and 53 % in Skeið and the number of ai per conception was 1.6 and 1.8, respectively. In Eyjafjörður, 23 % of the cows were inseminated at the time of first pp ovulation. Sixtytwo percent of these cows conceived. In Skeið, 20 cows were inseminated at the time of first pp ovulation, and 9 or 45 % of these cows conceived. The interval from calving to conception was, on the average, 92 days in Eyjafjörður and 100 days in Skeið.

Comparison of results from individual farms showed increase in number of conceptions to first pp ai (35—72 %) and decrease in number of services per conception (2.0—1.3) with increased mean number of days from calving to first ai (62—82 days).

ovulation; artificial insemination; conception; primiparous cows.

In modern dairy cow farming, female fertility is of a major economic importance (*Bulman & Lamming* 1978, *Janson* 1980). Ideally, the time of first calving, is at 2 years of age and the ideal interval between calvings is 365 days (*Britt* 1975, *Zeddies* 1982, *Haresign et al.* 1983, *Coleman et al.* 1985). Various environmental and managerial factors affect the reproductive performance of

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the dairy cow (*Ball* 1983, *Cavestany et al.* 1985, *Coleman et al.* 1985). Common fertility problems are, for example, delayed ovulations beyond feasible insemination dates, poor oestrus detection and a low conception rate (*Morrow et al.* 1969, *Ayalon* 1984, *Chauhan et al.* 1984, *Halpern et al.* 1985).

The amount of progesterone in milk reflects the blood concentration which in turn reflects the physiological status of the ovaries (*Cavestany & Foote* 1985, *Hansel* 1985). It has become a common practice to evaluate various reproductive factors by assaying progesterone in milk, often in connection with physical examination of the genital organs and evaluation of various blood components (*Lamming & Bulman* 1976, *Andresen & Onstad* 1979, *Claus et al.* 1983, *Larsson et al.* 1984).

In 1982 and 1983 we conducted a survey on the post partum (pp) fertility performance of dairy cows with fertility problems in southern Iceland. We assayed progesterone in milk sampled sequentially, examined the genital organs by rectal palpation and collected blood samples for assaying glucose, urea, calcium, magnesium and inorganic phosphate (*Eldon et al.* 1985). When evaluating the results, we had only results from studies on dairy cows from other countries for comparison. It was, therefore, decided to conduct a study of the postpartum reproductive performance of dairy cows on selected farms with good reproductive status in 2 areas in Iceland. The study was conducted in a similar fashion as the survey of the problem farms. The results will be used for comparison when evaluating the reproductive performance of dairy cow herds.

MATERIALS AND METHODS

Animals and study areas

The total of 252 Icelandic dairy cows on 9 farms in 2 areas were studied. Four farms were in the north of Iceland (Eyjafjörður) and 5 farms were in the south (Skeið) (Table 1).

Records of time and number of ai and time of calving were kept on the farms. All farms used ai. The cows were housed for 7—8 months in tie stalls and fed hay and feeding grain. In summer they were grased on cultivated pastures. On 2 farms, "18" and "14", the cows were milked in a separate milking parlour. On farm "18", the number of cows that fit into the milking parlour were freed from their tie stalls, milked and then tied up

Table 1. Total number of milking cows on the farms and number of cows entering the study in the north (Eyjafjörður) and in the south (Skeið).

	Eyjafjörður farms					Skeið farms					
	"41"	"52"	"18"	"76"	Total	"70"	"14"	"36"	"68"	"80"	Total
Total no. of milking cows	31	31	42	36	140	26	32	26	30	32	146
No. of animals in study	31	31	39	33	134	14	30	18	25	31	118

again. On farm "14" all cows to be milked were set loose at the same time and not tied up again until the milking was finished.

In Eyjafjörður, the mean temperature in January 1984 was —5.0°C* and the total precipitation was 54.6 mm. In July the mean temperature was 12.7°C and the total precipitation was 19.8 mm. Hours of daylength, from sunrise to sunset, were 24 in June and 3 in December.

In Skeið, the mean temperature in January 1984 was —3.0°C and the total precipitation was 85.4 mm. In July the mean temperature was 11.1°C and the total precipitation was 266.5 mm. The hours of daylength were 21 in June and 4 in December.

Examination and sampling

The genital organs were examined by rectal palpation once a month. Farm records were examined for the datas of calving, dates of ai, for number of cows slaughtered or sold and for diseases. Conception date was the date of ai after which conception was confirmed by later rectal palpation.

Sequential milk samples for progesterone profiles were taken every 5th day from day 10 postpartum until the first ai. Milk samples were also taken at the time of ai to evaluate the frequency of luteal phase inseminations. Thirty ml of milk were collected from each cow at the end of milking, preserved with sodium azide tablets (Merck) and stored at 4°C until assayed 1—2 months after collection.

Chemicals

(1,2,6,7,21-^{3}H)-Progesterone (195 Ci/mmol) and Atomlight® scintillation fluid were purchased from New England Nuclear. The progesterone for the calibration curve was purchased from Sigma Co. The charcoal, Norit A, and the gelatin were purchased

* The Icelandic Meteorological Office.

from Fischer Scientific Co. The Dextran T-70 came from Pharmacia Ltd. The reagents fort he phosphate buffered saline were purchased from Merck.

Equipment

^{3}H-Progesterone was counted on a Packard Tri-Carb Liquid Scintillation Spectrometer Model 3330. Pipetting was carried out using Eppendorf Varipette® and Multipette® pipettes. The centrifuge used was Beckman Model T-70. All the glassware used was Pyrex® from Corning Ltd. and the scintillation vials came from Hughes & Hughes Ltd.

Antiserum

The antiserum* was prepared by immunizing a sheep against an 11α-hydroxyprogesterone-hemisuccinate conjugate. Cross-reactivity with progesterone was 100 %; 17α-hydroxy-progesterone 9.5 %; 11α-hydroxyprogesterone 3.5 %; 11-desoxy-progesterone 3.1 %; 20.-dihydroxyprogesterone 1.3 %; other steroids, less than 1 % (*Castellanos & Edqvist* 1978). The antiserum was stored in small portions at —20°C.

Progesterone assay

Progesterone in fat free milk was assayed by a radioimmunoassay technique as reported by *Oltner & Edqvist* (1980, 1981).

A 5 ml portion from each milk sample was centrifuged at 400×g for 10 min at 4°C. The milk was then warmed to 37°C in a water bath and the fat floating on top discarded by suction. The milk was then vortex mixed.

Standards and samples were prepared in duplicate. To 100 µl of fat free milk or standard were added 93 kBk (10,000 c.p.m.) tritiated progesterone in 200 µl 0.15 mol/l phosphate buffered saline with 0.1 % gealtin (PBSG) pH 7.0, vortex mixed and incubated for 30 min at 4°C. The antiserum was added in 500 µl of 0.15 mol/l PBSG buffer. The antiserum was diluted 1:20,000 and bound 40 % of the ^{3}H-progesterone. After incubation for 12 h at 4°C, 500 µl of 0°C charcoal-dextran suspension in 0.15 mol/l PBS buffer without gelatine was added. The samples

* The antiserum was kindly provided by Prof. Lars-Eric Edqvist, Department of Clinical Chemistry, Swedish University of Agricultural Sciences, Uppsala, Sweden.

were then vortex mixed, incubated for 15 min at 4°C and then centrifuged at 800×g and 4°C for 10 min. One ml portion of the supernatant was counted in 4 ml of scintillation fluid for 10 min.

The standards for the calibration curve were prepared by diluting a stock progesterone solution (65 nmol/l in 96 % ethanol) to 32, 16, 8, 4, 2 and 1 nmol/l in a fat free milk taken from a postpartum cow in oestrus and without a palpable corpus luteum. The zero standard and the non-specific-binding (NSB) sample were taken from the same milk. The milk was diluted 1:1 in a PBS buffer without gelatine before the preparation of the standards.

Calculations

The percentage of bound progesterone in the standard/sample, compared to zero standard ($B_0 = 100$ % binding), was calculated, after subtracting the mean of the non-specific binding counts (NSB) from the mean counts for each standard/sample. The calibration curve of the progesterone assay was fitted by a computer to a linear logit/log curve. The log progesterone concentrations of the standards were plotted vs. their logit percent bound. The sample value was found by extrapolation of the % bound value on the calibration curve.

Inter- and intra-assay coefficients of variation, in a milk sample with the content of 4 nmol/l of progesterone, were 27.9 % and 7.4 %, respectively. The sensitivity of the assay was 1.1 nmol/l, average recovery was 97 %.

The number of days from calving to first pp ovulation were estimated by plottingt he progesterone profile. The last sample date before the progesterone curve rose above 3 nmol/l was estimated to be the date of ovulation.

Twohundred milk samples were assayed using both the method described above and a Farmos® progesterone in milk assay kit. The correlation coefficient (r) for the comparison of the results from the two assay methods was 0.9.

Statistical analysis

The analysis of data was carried out using a one way analysis of variance method as applied in the Minitab 82.1 software for the Vax 750 computer (*Ryan et al.* 1982). The natural logarithm (ln) of all values was used in the analysis. This resulted

in the data to be more normally distributed. Variables tested were age, the interval from calving to first pp ovulation, the time of first pp ai and the conception. These factors were tested for significant differences between areas, all farms, farms within areas, parities, months and seasons of calving and no. of ai per conception.

RESULTS

The total number of cows studied was 252. The number of cows for which respective data was available are presented in the tables. No cow, with available data, was omitted from the data processing.

Age and state of health

The age of the cows at calving was from 2—12 years ($\bar{x} = 5.1$, years, SD = 2.5). In Eyjafjörður the mean age was 5.6 years (SD = 2.8) (Table 2, Fig. 1). Seventeen percent of the cows were primiparous. Eight percent of the cows were slaughtered or sold. The oldest cows were on farm "52" ($\bar{x} = 6.8$ years, SD = 3.3) with 13 % of the cows primiparous. The youngest cows were on farm "41" ($\bar{x} = 4.5$ years, SD = 2.1) with 25 % of the cows primiparous. Cystic ovaries were found in 2 cows. Metritis was reported in 1 cow and 6 animals were diagnosed with clinical ketosis.

In Skeið the mean age was 4.5 years (SD = 2.1) (Table 2, Fig. 1). Thirtyone percent of the cows were primiparous. Twentyone percent of the cows were slaughtered or sold. The cows were oldest on farm "68" ($\bar{x} = 5.1$ years, SD = 2.0) with

Table 2. The age, in years, of the cows at calving and the percentage of primiparous cows on each farm.

	Eyjafjörður farms					Skeið farms					
	"41"	"52"	"18"	"76"	Total	"70"	"14"	"36"	"68"	"80"	Total
n	28	30	33	33	124	14	22	18	24	31	109
$\bar{x}$ age	4.5	6.8	6.1	5.1	5.6	5.0	4.4	4.8	5.1	3.8	4.5
SD age	2.1	3.3	2.9	2.5	2.8	2.6	2.2	2.3	2.0	1.5	2.1
Min. age	2.0	2.3	2.0	1.8	1.8	2.0	2.3	2.0	2.3	2.0	2.0
Max. age	9.9	12.0	12.4	11.9	12.4	8.5	10.1	8.7	8.8	7.6	10.1
Primiparous cows (%)	25	13	18	12	17	29	45	22	21	36	31

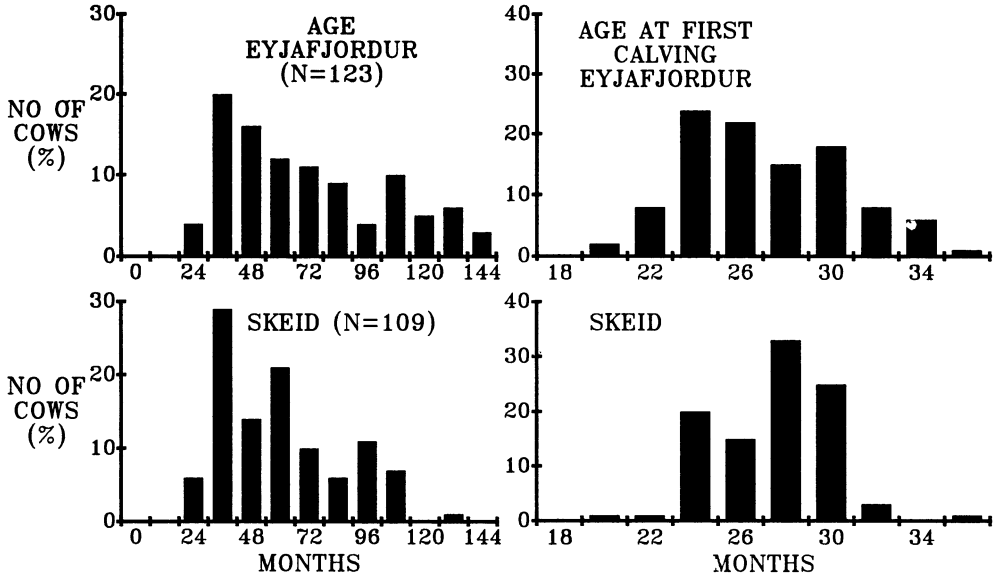

Figure 1. The frequency distribution of the age of the cows on the calving date, and the age at first calving, in months.

Table 3. The levels of significance from the analysis of variance; (ns) = not significant ($P > 0.05$); (*) = ($P < 0.05$), (**) ($P < 0.01$), (***) = ($P < 0.001$).

	Source of variation								
Category	1	2	3	4	5	6	7	8	9
A	*	*	*	*	*	ns	***	***	ns
B	ns	**	***	*	ns	ns	ns	ns	*
C	ns	ns	ns	*	ns	***	ns	ns	**
D	***	***	*	*	—	—	ns	ns	ns

A: Time of first pp ov
B: Time of first pp ai
C: Time of conception
D: Age

1: Area
2: All farms
3: Eyjafjörður farms
4: Skeið farms
5: Primiparous vs. multiparous
6: Cows conceiving to first ai vs. rest of cows
7: Month of calving
8: Season of calving
9: No. of ai per conception

21 % of primiparous cows and youngest on farm "80" ($\bar{x} = 3.8$ years, SD = 1.5) with 36 % of first calves. Cystic ovaries were discovered in 4 cows. Retained placenta and metritis was reported in 3 cows and 16 developed clinical ketosis.

The difference in age between areas and between farms was statistically significant ($P < 0.01$) (Table 3).

Calving

The cows calved all year round. In Eyjafjörður most of the calvings were in March—May. In Skeið the calvings were more evenly distributed throughout the year (Fig. 2). Forty seven percent of all primiparous cows calved in September—November. Primiparous cows were 48 % of all cows that calved during this period.

The mean age at first calving was 27 months in both areas (Fig. 1). This age was lowest 24 months (SD = 2.1) on farm "76" and highest 29 months (SD = 3.2) on farm "18". This difference was statistically significant ($P < 0.01$).

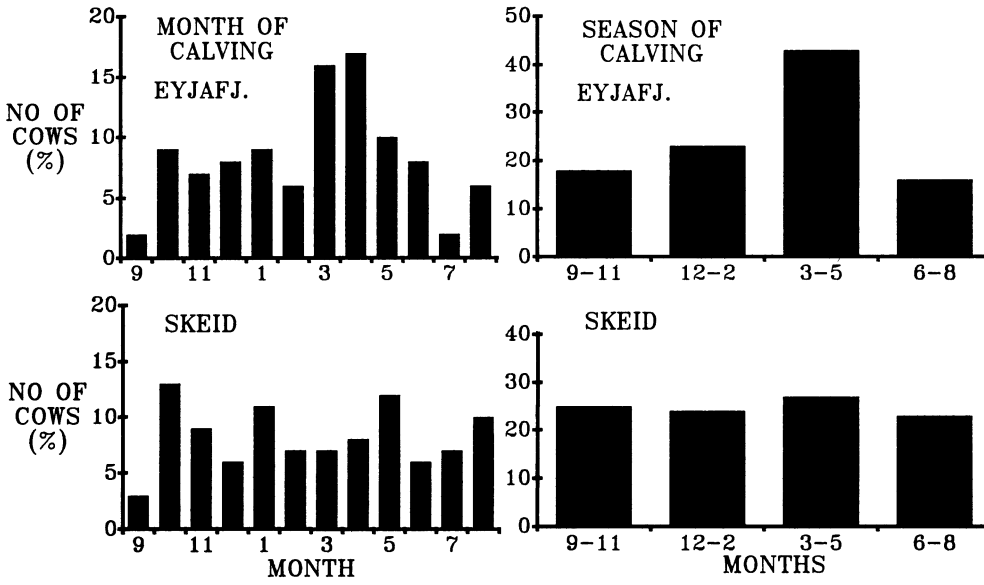

Figure 2. The frequency distribution of the number of cows calving in each month and in each season.

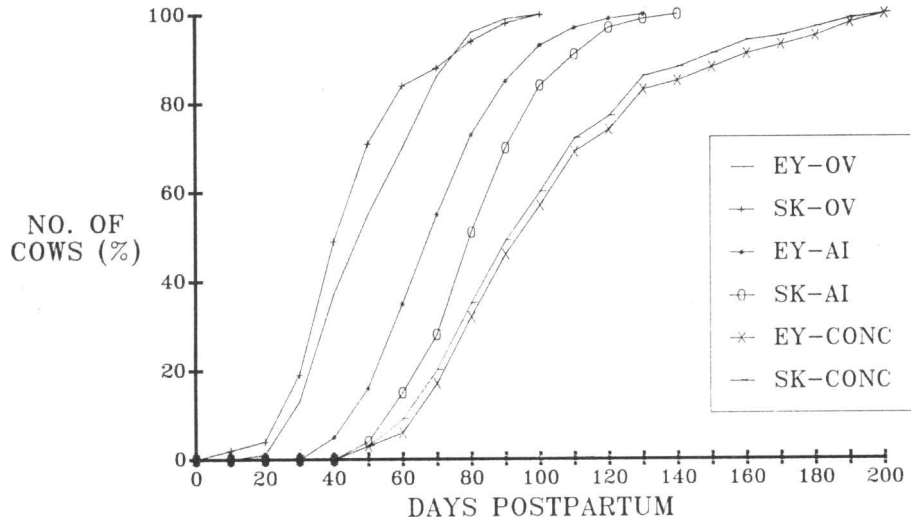

Figure 3. Time of the first pp ovulation, the first pp ai and the conception in Eyjafjörður and in Skeið. Cumulative no. of cows (%).

Ovulation

In Eyjafjörður, first pp ovulation was, on the average, 42 days (SD = 20.6) after calving. The range of means, for the individuals farms, was 35—58 days (Table 4, Fig. 3).

In Skeið, first pp ovulation was, on the average, 37 days (SD = 21.7) after calving. The range of means, for the individual farms, was 29—52 days (Table 4, Fig. 3).

The difference in mean number of days from calving to first

Table 4. The interval from calving to first postpartum ovulation and the number of days from parturition until 50, 75 and 90 % of the cows had ovulated.

	Eyjafjörður farms					Skeið farms					
	"41"	"52"	"18"	"76"	Total	"70"	"14"	"36"	"68"	"80"	Total
n	27	30	36	32	125	13	29	18	23	30	113
$\bar{x}$ days	35	45	46	58	42	43	29	52	33	38	37
SD days	15.1	26.9	18.7	18.1	20.6	24.8	18.2	29.4	17.8	18.7	21.7
Min. days	12	12	10	18	10	11	7	17	11	9	7
Max. days	68	133	80	95	133	104	102	144	75	86	144
Percentiles:											
50	30	39	34	60	39	39	25	48	28	33	32
75	45	54	48	69	55	45	33	68	43	45	45
90	54	58	66	81	66	83	39	72	62	64	66

pp ovulation between farms within areas and between areas was statistically significant (Table 3).

Primiparous cows ovulated earlier pp ($\bar{x} = 39$ days, SD = 27.5) than did multiparous cows ($\bar{x} = 42$ days, SD = 18.5). The difference was statistically significant ($P < 0.05$) (Table 3). There was a negative correlation between the relative number of primiparous cows o neach farm and the mean number of days from calving to first pp ovulation ($y = -0.6x + 57$, $r = -0.7$).

Cows calving in September—November ovulated, on the average, 30 days pp (SD = 20.1). Cows calving other months of the year ovulated, on the average, 43 days pp (SD = 20.6) (Fig. 4). This difference was statistically significant ($P < 0.01$) (Table 3).

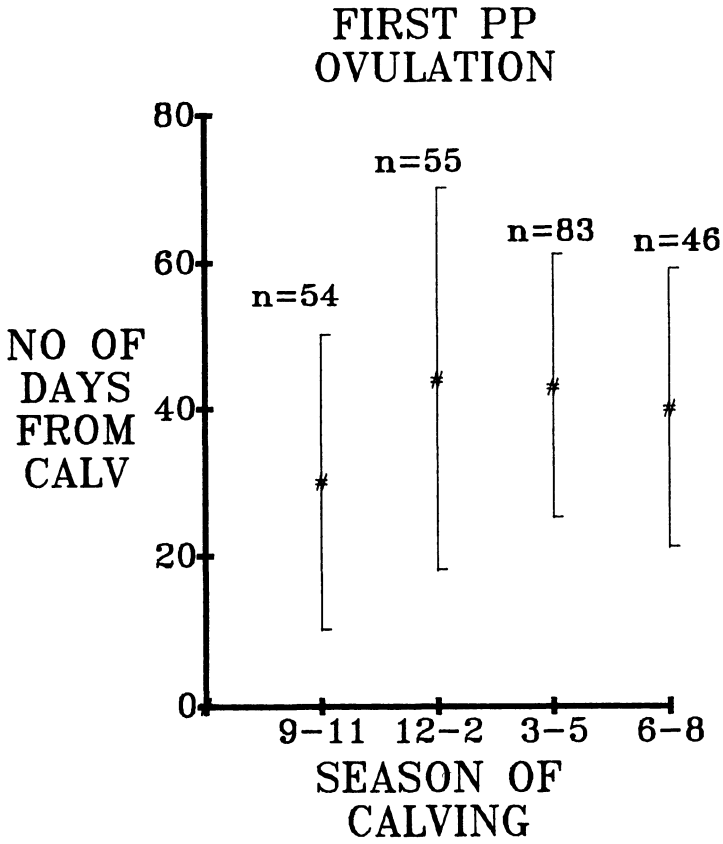

Figure 4. The time of the first pp ov ± 1 SD for both areas combined, in relation to the month and season of calving (months).

The mean length of the first pp ovarian cycle of 173 cows was 16 days (SD = 4.4) and the mean of the highest progesterone values measured was 8 nmol/l (SD = 4.5). The mean length of the second ovarian cycle of 88 cows was 20 days (SD = 2.5) and the mean of the highest progesterone values assayed was 9 nmol/l (SD = 4.2). The first pp ovarian cycle was $\leq$ 15 days in 57 % of the cows. The total mean of the highest progesterone values of the cycles that were $\leq$ 15 days in lenght, were 8 nmol/l (SD = 3.9) and of the cycles that were > 15 days, 10 nmol/l (SD = 4.9). This difference was statistically significant ($P < 0.05$).

AI

In Eyjafjörður the interval from calving to first pp ai was, on the average, 72 days (SD = 23.1). The range of means, for the individual farms, was 61—82 days (Table 5, Fig. 3).

Twelve percent of the cows in Eyjafjörður had been inseminated (first pp ai) when progesterone in milk was more than 3 nmol/l.

In Skeið, the interval from calving to first pp ai was the same as in Eyjafjörður, 72 days (SD = 22.6). The range of means was 64—83 days (Table 5, Fig. 3).

Five percent of the cows in Skeið had been inseminated when progesterone in milk was > 3 nmol/l.

The difference in number of days from calving to first pp ai between farms within areas was statistically significant ($P < 0.05$) (Table 3).

Table 5. The interval from parturition to first pp ai and the number of days from calving when 50, 75 and 90 % of the cows had been inseminated (first pp ai).

	Eyjafjörður farms					Skeið farms					
	"41"	"52"	"18"	"76"	Total	"70"	"14"	"36"	"68"	"80"	Total
n	27	28	37	32	124	11	27	18	24	30	110
$\bar{x}$ days	73	61	82	69	72	83	76	77	64	68	72
SD days	20.9	16.7	25.0	15.5	23.1	22.4	16.1	30.7	21.7	21.8	22.6
Min. days	40	34	40	46	34	54	47	44	17	40	17
Max. days	118	112	150	100	150	128	109	144	100	147	147
Percentiles:											
50	73	59	79	70	69	80	77	68	66	67	69
75	90	71	94	80	84	90	84	97	81	74	84
90	96	78	110	89	99	106	97	113	91	89	101

Table 6. The interval from parturition to conception and the number of days from calving, when 50, 75 and 90 % of the cows had conceived the rate to first ai and the number of ai per conception.

	Eyjafjörður farms					Skeið farms					
	"41"	"52"	"18"	"76"	Total	"70"	"14"	"36"	"68"	"80"	Total
n	24	25	32	31	112	11	27	17	22	29	106
$\bar{x}$ days	94	95	99	81	93	120	86	115	92	106	100
SD days	44.0	54.2	44.7	27.4	42.7	55.0	21.9	43.8	38.9	40.9	39.1
Min days	46	34	51	46	34	62	47	44	43	40	40
Max. days	222	249	265	157	265	208	140	179	181	189	208
Percentiles											
50	76	75	87	85	82	98	84	112	84	94	89
75	111	115	111	94	111	156	99	155	102	138	124
90	143	174	150	118	150	201	109	175	144	161	161
Conception to first ai (%)	68	35	71	55	58	50	72	41	52	44	53
No. of ai per conception	1.4	2.0	1.3	1.6	1.6	1.8	1.4	2.1	1.7	2.1	1.8

Conception

The interval from calving to conception in Eyjafjörður was, on the average, 93 days (SD = 42.7). The range of means, for the individual farms, was 81—99 days (Table 6, Fig. 3).

Conception to first ai in Eyjafjörður was 58 % and the number of inseminations per conception was 1.6. The conception rate to first ai was a high 71 % with 1.3 ai per conception and a low 35 % with 2.0 ai per conception (Table 6).

Twentythree percent of the cows in Eyjafjörður were inseminated at the time of first pp ovulation ($\bar{x}$ = 57 days, SD = 11.8). Sixtytwo percent of these cows conceived to that service.

In Skeið, the interval from calving to conception was 100 days (SD = 39.1). The range of means was 86—120 days (Table 6, Fig. 3).

Conception rate to first ai was 53 % and the number of ai per conception was 1.8. The conception rate to first ai was a high 72 % with 1.4 ai per conception and a low 41 % with 2.1 ai per conception (Table 6).

Seventeen percent of the cows in Skeið were inseminated at the time of first pp ovulation ($\bar{x}$ = 66 days, SD = 28.4). Forty-five percent of these cows conceived to that service.

In both areas the conception rate to first ai increased (35—72 %) and the number of ai per conception decreased (2.0—1.3) with increasing mean number of days from calving to first pp ai (62—82 days).

The number of ai per conception did not change with age, nor was there any difference in conception rate between primiparous and multiparous cows. There was no relationship between the number of days from calving to first pp ov and the number of ai per conception. There was no significant difference in mean number of days from calving to conception between areas nor between farms in Eyjafjörður, but there was a significant difference between farms in Skeið ($P < 0.05$) (Table 3).

DISCUSSION

The mean age of the cows in Skeið was significantly lower than in Eyjafjörður (4.5 vs. 5.1 years). The number of primiparous cows was higher in Skeið (31 % vs. 17 %) and also the number of cows slaughtered or sold. The mean age at first calving was the same in both areas, 27 months. The mean age of 31,000 dairy cows in Sweden was 3.7 years and the number of primiparous cows was 31 % (*Janson* 1980). The mean age at first calving for 24,000 Swedish dairy cows was 29.7 months (*SHS Report* 1985). *Coleman et al.* (1985) reported 4.6 years as average age and 29 months as average age at first calving for 19 dairy cow herds in Western Virginia, USA.

The frequency of diseases of the genital organs was low. Cystic ovaries were found in 2 cows in Eyjafjörður and in 4 cows in Skeið. In a survey done on dairy cows on farms in southern Iceland, no ovarian cysts were found (*Eldon et al.* 1985). *Larsson et al.* (1984) found ovarian cysts in 11 % of 291 Swedish dairy cows. *Roine & Saloniemi* (1978) reported that ovarian cysts had been diagnosed in 4.1 % of 2300 Finnish dairy cows. *Coleman et al.* (1985) found ovarian cysts in 9.7 % of 2500 dairy cows in Western Virginia.

Clinical ketosis was reported in 6 cows in Eyjafjörður and in 16 cows in Skeið. This disorder was reported in 35 % of dairy cows on problem farms in southern Iceland (*Eldon et al.* 1985). Hyperketonaemia was found in 8.9 % of 3000 Swedish dairy cows during the first month after parturition (*Andersson & Emanuelsson*, submitted).

The mean number of days from parturition to first pp ov was significantly lower in Skeið than in Eyjafjörður (37 vs. 43 days). This period was 40 days in cows on farms in southern Iceland (*Eldon et al.* 1985). *Larsson et al.* (1984) reported this

interval to be 26.5 days in 291 Swedish dairy cows. *Bulman & Lamming* (1978) reported that 535 Friesian and Ayrshire dairy cows in England had resumed cycles, on the average, 24 days pp. *Morrow et al.* (1969) reported that in most cows the interval from parturition to first pp ov in 85 normal cows was 15 days.

The farm in each area that had the greatest number of primiparous cows ("41" and "14"), had the shortest average interval from calving to first pp ovulation and the highest conception rate. *Rosenberg et al.* (1977) found that the interval from parturition to the first pp progesterone peak was significantly longer in primiparous cows. *Larsson et al.* (1984) found that parity was not significant for time of first pp ovulation.

On farm "14" the cows were set free from the tie stalls twice a day during the milking period. *Claus et al.* (1983) found that acyclia was significantly longer in cows housed in tie stalls as compared with cows housed in loose housing. On the other hand, *King et al.* (1976) reported that oestrus was detected significantly later in cows housed in free stalls compared to tie stalls.

Cows that calved in September—November ovulated significantly earlier than cows that calved in other months. Forty-eight percent of these cows were primiparous. During these 3 months the cows were probably on a high nutritional plateau after grasing all summer on cultivated pastures. The difference in the number of daylight hours could possibly have played a part in the difference in onset of cyclicity between seasons and between areas. *Bulman & Lamming* (1978) found that the interval from parturition to first pp ovulation varied significantly with season. *McNatty et al.* (1984) stated that this period is shorter in a long photoperiod due to seasonal difference in gonadotropin secretion. *Montgommery et al.* (1985) stated that season of calving influenced resumption of ovarian cycles and that the nutrition before and after parturition influenced the interval from calving to oestrus.

The length of the first and second ovarian cycles, the number of short cycles and the amount of porgesterone in milk assayed during those cycles were in agreement with the findings of other authors (*Mather et al.* 1978, *Kindahl et al.* 1982, *Williams et al.* 1983, *Edqvist et al.* 1984, *Larsson et al.* 1984, *Eldon et al.* 1985).

The interval from parturition to first pp ai was, on the average, 60—80 days pp. This interval was 74—78 days pp for cows

in southern Iceland (*Eldon et al.* 1985). *Britt* (1975) stated that cows must conceive by 85 days pp to deliver the next calf within a year. *Larsson et al.* (1984) reported the average interval from parturition to first pp ai as 67.2 days.

Luteal phase inseminations were 12 % in Eyjafjörður and 5 % in Skeið. The same figure was 20 % on problem farms in southern Iceland (*Eldon et al.* 1985). The incidence of luteal phase inseminations in this study is similar to the findings of *Hoffmann et al.* (1976), *Andresen & Onstad* (1979), *Oltner & Edqvist* (1981) and *Claus et al.* (1983) for normal cows.

The interval from parturition to conception was, on the average, 80—120 days pp, which makes the average calving interval 367—407 days. The conception rate to first ai was 58 % in Eyjafjörður and 53 % in Skeið. The conception rate to first ai in cows in southern Iceland was 49 % (*Eldon et al.* 1985). *Larsson et al.* (1984) reported that the average interval from parturition to conception in a herd of Swedish dairy cows was 95.3 days. *Janson* (1980) reported that the mean interval from parturition to last insemination for a large number of Swedish dairy cows was 103 days, the conception rate to first service was 55 %. *Larsson et al.* (1984) reported an average interval from calving to conception of 95.3 days. *Reimers et al.* (1985) found a 59 % conception rate to first pp ai in 4500 dairy cows in the northeastern United States.

Conception rate increased and the number of ai per conception decreased with increasing number of days from parturition to first pp ai. In contrast, cows in Eyjafjörður, that were inseminated during first pp oestrus ($\bar{x} = 57$ days pp), had a higher conception rate (62 %) than the average for that area. *Britt* (1975) stated that there was an inverse relationship between interval to first insemination and number of inseminations per conception. *Larsson et al.* (1984) reported a low conception rate to early inseminations.

On farms "52" and "18" the interval from parturition to first pp ov was similar. The interval from parturition to first pp ai was 61 and 82 days, respectively and the number of ai per conception was 2.0 and 1.3, respectively. This led to similar results, concerning time of conception ($\bar{x} = 95$ vs. 99 days), in spite of 21 days difference in mean time of first pp ai.

The results indicate that the reproductive performance of normal Icelandic dairy cows is similar to that of Swedish dairy

cows in spite of later onset of pp ovarian activity. The most significant factors affecting the interval from parturition to first pp ovulation were month of calving and the number of primiparous cows. The most significant factor affecting the time from parturition to conception was the time of first pp ai which in turn affected the conception rate to first ai and the number of ai per conception. The frequencies of luteal phase inseminations and diseases of the genital organs were too low to be of importance.

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SAMMANFATTNING

Reproduktionsstatus postpartum hos mjölkkor i två områden på Island.

Artikeln beskriver reproduktionsstatus postpartum (pp) hos 252 mjölkkor i två områden på Island, i norra (Eyjafjörður) och i södra (Skeið) delen av Island, över en 12 månaders period.

Första ovulationen pp förekom tidigare hos primipara kor i Skeið-området och hos kor som kalvade i September-November.

Tiden för första artificiella inseminationen (ai) var i genomsnitt 72 dagar. Dräktigheten efter första ai hos dessa kor var 58 % i Eyjafjörður och 53 % i Skeið, och antal ai per dräktighet var 1.6 respektive 1.8. I Eyjafjörður blev 23 % av korna inseminerade vid första ovulationen och 62 % av dessa blev dräktiga. I Skeið blev 20 % av korna inseminerade vid första ovulationen och 45 % blev dräktiga.

Intervallet från kalvning till dräktighet var i genomsnitt 92 dagar i Eyjafjörður och 100 dagar i Skeið.

Vid jämförelse av resultat från enstaka gårdar visade en ökning i antal dräktigheter till första ai (35 till 72 %) och minskning i antal ai (2.0 till 1.3) med ökad antal dagar från kalvning till första ai (62—82 dagar).

Resultaten visar att:

1. Första ovulationen pp förekom tidigare hos "normala" kor i Skeið-området, primipara kor och hos kor som kalvade i September-November.
2. Dräktighet till första ai ökade och antal ai per dräktighet minskade med ökat antal dagar från kalvning till första ai.
3. Olika inseminationsrutiner (första ai tidig/sen) kan ge liknande resultat angående dräktighetstidpunkten.

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