The Effect Of Retained Placenta And Metritis Complex On Reproductive Performance In Dairy Cattle — A Case Control Study

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Summary

A study of the computer stored records of 293 dairy cows and 652 calvings reveals the effects of retained placenta and metritis complex on reproductive performance. The overall incidence rate of retained placenta was 11.2%. Retained placenta was 4.6 times more likely to occur following twin births than following single births. Most cases of retained placenta occurred during the fall. Forty-five percent of that seasonal increase was explained by an increased number of calvings. Metritis complex was diagnosed following 54.8% of retained placenta cases. Retained placenta alone did not significantly impair reproductive performance. Metritis complex, in the presence or absence of retained placenta, caused a significant ($P \leq 0.05$) increase in days open, services per conception, calving to first heat intervals and days from calving to first service. There is an indication (interaction $P \leq 0.1$) that cows with both retained placenta and metritis complex are more severely affected than cows with either retained placenta or metritis complex alone. **The influence of retained placenta on fertility appears to depend on the proportion of cows with retained placenta that have metritis complex.**

Introduction

The etiology of retained placenta in the bovine is complex. Retained placenta (RP) is due to the failure of the villi of the foetal cotyledons to separate from the crypts of the maternal caruncle. Retained placenta had been considered to exist if the placenta is not expelled within 12 hours postpartum (22). From a study of 7387 calvings there was a 10.3% incidence rate of RP (8). In another study of 36,218 pastured dairy cattle the incidence rate of RP was 1.96% (14). Factors influencing the incidence of RP include abortion, dystocia, multiple births, concurrent disease, age, nutrition, season of the year and gestation length (3, 8, 14, 16, 26). Abortions, stillbirths, and twin calvings resulted in increased incidence rates of 25.9%, 16.4%, and 43.8% respectively (8). Corticosteriod induced parturition is associated with a high incidence of RP (6).

The effect of RP on subsequent reproductive performance is unclear. Some report that RP has no significant effect on fertility (16): whereas other authors have demonstrated impaired fertility (6, 15, 18, 26) and shortened reproductive life in cows with reproductive tract abnormalities which were more frequent after RP (8). Reduced fertility due to RP has been reported in cows following corticosteroid induced parturition (20). Other investigations of cows with RP following induced parturition have reported normal reproductive rates when the cows were treated with antibacterials (21, 25) or when left untreated (2, 11).

The occurrence of metritis, endometritis and subsequently pyometra has been associated with abnormal parturitions including dystocia, RP and abortion (22). Occasionally these uterine conditions will develop after breeding and after embryonic death (9). Some postpartum metritis cases are continuations of gestational uterine infections (10). In the practice situation the number and variety of clincal manifestations make differential diagnosis difficult since to obtain a definitive diagnosis, accurate estrus cycle information and histopathological examination are required (10). A more realistic approach would be to view clinical metritis, endometritis and pyometra as variations of the same disease and combine them into one diagnostic

"This article was previously published in the Canadian Veterinary Journal, 20:131-135 (May, 1979).

category (7). There is general agreement that these uterine conditions impair fertility to varying degrees depending on their severity and duration (8, 15, 23).

The purpose of this investigation is to determine the influence of retained placenta and metritis complex on subsequent reproductive performance in dairy cattle. Description of some of the etiological factors influencing the incidence of retained placenta are also included.

Materials and Methods

In 1973 the Farm Service Clinic at the Ontario Veterinary College, Guelph, Ontario, Canada implemented a computerized health data recording and reporting system (13). Data, including calving, heat and breeding dates, disease occurrences and treatments administered, were recorded on the farm both by the veterinarian and by the farmer. Information collected was stored on computer tape files from which various reports on health and reproductive performance were produced. Data from four farms for the period 1973 to 1976 were selected for analysis. All farms were participants in the preventative medicine program offered by the Farm Service Clinic. The rations of farms A, B and D, consisted of corn silage hay and concentrate: whereas farm C utilized alfalfa and grass haylage and high moisture corn. Farms in the Guelph area are restricted to a six month pasture season. Winter housing on all farms was the conventional tie-stall system. Artificial insemination was used exclusively on all farms.

Over the study period the records of 293 purebred Holstein dairy cows and 652 calvings were examined. Retained placenta was defined as failure to expel the placenta within 24 hours postpartum. All farms under study had adopted the conservative approach for RP treatment advocated by the Farm Service Clinic. Farmers were instructed to monitor appetite, milk production and/or daily rectal temperature readings. If rectal temperature exceeded 39° C, penicillin-streptomycin was administered by intramuscular injection twice daily by the farmer. Only cows showing signs of systemic illness were examined by a veterinarian. If treatment was required, parenteral antibiotics were favored over local treatment or manual removal.

For the purpose of this study, clinically diagnosed cases of metritis, endometritis and pyometra were grouped under the single description of metritis complex (MC).

Three case groups were defined for a case control study. These included cows with RP only (RP), cows with RP and metritis complex (RP + MC) and cows with metritis complex only (MC). The controls were matched with the cases on the basis of age, farm, year and season of calving. If two or more appropriate controls were available, the cow calving closest to the case was selected. Age was matched within one year except in four cases of cows over eight years of age being matched with younger (one to three years) controls. Case and control groups were compared with respect to days open, i.e. days from calving to conception, services per conception, calving to first observed heat and calving to first service. The data were analysed by analysis of variance for factorial design (17).

Results and Discussion

Incidence

During the four year study period 33 cases of RP, 40 cases of RP + MC and 13 cases of MC were recorded from a total of 652 calvings. The fate of cows with each condition is summarized in Table I. Twenty-two percent (19 of 86) of all RP and MC cases were removed from the herds: nine due to infertility (10.5%), eight (9.3%) for other reasons and two deaths (2.3%) due to septic metritis following RP. Similar mortality and infertility rates have been reported (1). A study on Canadian dairy cow disposal reports that 2.2% to

Table I
Fate of Cows Subsequent to Retained Placenta (RP) and or Metritis Complex (MC)

Disease	Conceived	Culled (Infertility)	Culled (Other)[a]	Death Due To MC	Total
RP only	26	3	4	0	33
RP + MC	29	6	3	2	40
MC only	12	0	1	0	13
Totals	67	9	8	2	86
% of all cases	77.9	10.5	9.3	2.3	

[a]*Udder injuries, old age, poor conformation, low production, chronic mastitis.*

Table II
Incidence of Retained Placenta In Cows From Four Farms (1973 to 1976)

Year	Farm				Year
	A	B	C	D	Totals
1973	29[a]	37	32	59	157
	1[b]	5	4	6	16
	3.5[c]	13.5	12.5	10.2	10.2
1974	33	39	38	70	180
	9	3	4	7	23
	27.3	7.7	10.5	10.0	12.8
1975	34	43	35	59	171
	4	7	3	7	21
	11.8	16.3	8.6	11.9	12.3
1976	25	28	37	54	144
	6	1	4	2	13
	24.0	3.5	10.8	3.7	9.1
Farm Totals	121	147	142	242	652
	20	16	15	22	73
	16.5	10.9	10.5	9.1	11.2

[a]*Number of calvings*
[b]*Number of retained placenta*
[c]*Percentage of calvings with retained placenta*

3.6% of all cows culled annually are related to breeding problems (4). By comparison it would appear that the culling rate of the cases is higher than expected and that these two disease syndromes have an inordinated impact on disposal rates. The influence of the presence of RP and/or MC on a farmer's decision to cull a cow is unknown. Farm D was responsible for five of eight (62%) cullings for poor conformation which may indicate more rigorous selection and/or reflect the owners' awareness that such cows are likely to have RP or an associated problem sometime later (8).

The annual incidence rate of RP over the four years 1973 to 1976 was 10.2%, 12.8%, 12.3% and 9.0% respectively, with an overall incidence rate of 11.2%. The lowest and highest annual incidence rates were 3.5% and 27.3% recorded on farm A during successive years (Table II). Similar overall incidence rates and year to year variability within farms has been reported (5.22). The incidence rate of RP following twin calvings was 45.8% versus 9.9% for single calvings. This indicates that RP is 4.6 times more likely following multiple births than single births (Table III). The overall incidence rate of twin births was 3.68% which is similar to that reported (3.08%) by other authors (12).

Table III
The Association Between Twin Births And Retained Placenta In Cows From Four Herds (1973 to 1976)

	Retained Placenta		
Twin Birth	Present	Absent	Totals
Present	11	13	24
Absent	62	566	628
Totals	73	579	652

Chi square = 30.06 (significant at $P \leq 0.001$)

Seasonal variation in the incidence of RP was notable: most cases occurring during October through December (Table IV). This was partially related to the fact that more calvings occurred during that period. A positive correlation of 0.67 was found between the number of calvings and the number of RP cases, indicating that 45% of the variation in occurrence of RP could be explained by an increase in the number of calvings. The seasonal effect appears to have increased the number of RP cases in July through September by three and by 11 in October through December. A higher incidence in July through October has been reported (8), whereas other surveys have indicated different seasonal patterns implicating later winter feeding as contributing to a higher incidence in March through May (24, 26).

The incidence of metritis complex (with or without RP) over the study period was 8.1%. The incidence rate of MC only was 2%. Metritis complex was diagnosed following

Table IV
The Relationship of Season of Calving and The Incidence of Retained Placenta (RP) in Four Herds (1973 to 1976)

	Number of RP	Percentage of Cases	Percentage of Calvings	Number of Calvings
Jan. to Mar.	11	15.1	6.8	163
Apr. to June	8	11.9	6.0	133
July to Sept.	22	30.1	13.0	169
Oct. to Dec.	32	43.8	17.1	187

Chi square = 13.98 (significant at $P \leq 0.001$)
Correlation coefficient (number of RP and number of clavings) = 0.67
Coefficient of determination = 0.45

Table V
Mean Value of Days Open (DO) for Cows From Four Herds Classified According to Presence Or Absence of Retained Placenta (RP) and Metritis Complex (MC)

	MC	MC	Means (DO) for RP	
	Present	Absent	Unadjusted	Adjusted for MC
RP	178±86[a]	110±50	146	135
Present	29[b]	26	55	55
RP	137±67	115±50	118	126
Absent	12	67	79	79
Means (DO) for MC	165	114		
Unadjusted	41	93		
Adjusted for RP	163	115		
	41	93		

[a]*Mean (DO)* ± standard deviation (rounded to nearest day)
[b]Number of cases
Means = weighted column or row mean
Means (MC) significantly different at $P \leq 0.05$ $F = 14.58$
Means (RP) not significantly different at $P \leq 0.05$ $F = 0.66$
Interaction significantly different at $P \leq 0.10$
Overall mean = 130.01
Overall standard deviation = 61

54.8% (40 of 73) of RP occurrences. This indicates that MC is 25 times more likely to occur with RP than subsequent to calving with no history of RP.

Effect on Reproductive Performance

Table V shows the effect of RP and MC on days open (DO). Cows with RP had a higher mean DO than non-RP cows (146 vs 118) but this difference was not statistically significant ($P > 0.05$). When these mean values were adjusted for the effect of MC the difference decreased to 135 vs 126. This decrease (from 28 to nine days) indicated that much of the apparent effect on DO in RP cows was due to MC. Cows with MC had a higher mean DO than non-MC cows (165 vs 114). This difference was statistically significant ($P \leq 0.05$),

and the small decrease between the unadjusted means (51 vs 48) indicates that very little of the effect on DO in MC cows is due to RP. Considering the simple effect of DO in RP cows (68, i.e. 178-110) and non-RP cows (22, i.e. 137-115) it appears that cows with both RP and MC are more severely affected than cows with either MC or RP alone. This interaction (68 vs 22), was not statistically significant at ($P \leqslant 0.05$) but was significant at ($P \leqslant 0.10$) and thus warrants further investigation.

Table VI summarizes the adjusted and unadjusted mean values for services per conception (S/C), days from calving to first observed heat (C-HI) and days from calving to first service (C-SI). Since there was no indication of interaction between RP and MC, only the column and row means are presented. The difference of means and adjusted means for S/C, C-HI and C-SI were significantly higher ($P \leqslant 0.05$) for MC cows than non-MC cows. The occurrence of RP did not have a statistically significant effect on S/C, C-HI or C-SI.

Table VI
Mean Values of Services per Conception (S/C) Calving to First Heat (C-H1) and Calving to First Service (C-S1) for Cows Classified According to Presence or Absence of Retained Placenta (RP) and Metritis Complex (MC)

	MC		RP	
	Present	Absent	Present	Absent
Number	41	93	55	79
S/C	2.47	1.81	2.20	1.88
Adjusted	2.44	1.82	2.07	1.97
SD=1.32				
C-H1 (days)	66	51	59	53
Adjusted	65	51	56	55
SD=23.55				
C-S1 (days)	108	83	95	88
Adjusted	109	83	90	92
SD=32.84				

SD = Standard deviation = square root of residual mean square

Adjusted = mean adjusted for RP or MC

Mean and adjusted means (MC present vs MC absent) are significantly different at ($P \leqslant 0.05$)

Means and adjusted means (RP present vs RP absent) are not significant different at ($P \leqslant 0.05$)

These data indicate that occurrence of RP and MC are associated ($P \leqslant 0.05$) but that RP alone has little effect on subsequent fertility. The apparent effects of RP are primarily the result of the MC and it is the MC that has the adverse effect on reproductive performance. Findings from this study support the suggestion that RP is a predisposing factor and that MC should be considered as the immediate cause of low fertility (8, 19). The extent to which RP influences fertility would seem to primarily depend on the proportion of cows with RP that have MC.

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