

Effect of Health and Reproductive Disorders on Milk Yield and Fertility in Dairy Cows

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Introduction

Economic returns of dairy farms are dependent upon milk production and reproductive efficiency of dairy cows. The incidence of different diseases and reproductive disorders is very often subject of epidemiological studies.⁴ Several studies found 305-d milk production to be affected in cows suffering from various clinical diseases and reproductive disorders.^{2,3,8} Other publications have shown that disease exposure can increase days open and subsequently reduce both productivity and profitability.^{1,5,6,9} Many diseases and risk factors need to be examined as a complex, and not individually, if true relationships are to be understood. A proper understanding of the relationships between herd health status, milk yield and reproductive performance in dairy cows is still required. The aim of the present investigation was to relate the severity of health problems with cows' reproduction and performance.

Materials and Methods

A data set of 1153 lactations of the same number of Friesian cows located on five farms in 1989 was available. The set contained information on 10 veterinary diagnoses (ketosis, parturient paresis, indigestion, mastitis, lameness, retained placenta, endometritis, cystic ovaries, abortion, still birth). Analyzed reproduction parameters were: calving to first service interval, first service to conception interval, calving to conception interval, conception rate and number of services/conception. The influence of farm, lactation number and disease incidence on milk yield was evaluated using the following model:

$$Y_{ijkl} = \mu + O_i + L_j + B_k + e_{ijkl}$$

Y_{ijkl} = observed milk yield of animal 1
 μ = average value of observed parameter
 O_i = influence of farm
 L_j = influence of lactation number ($i = 1, 2, 3, 4, 5, 6$)
 B_k = influence of disease ($k = 1, 2, 3, \dots, 10$)
 e_{ijkl} = error

Differences in reproduction parameters between cows suffering from specific risk factor are presented in the following tables.

Results and Discussion

High frequency of different diseases and reproductive disorders on five large farms were the reason for the present investigation. Based on results obtained on farms a herd health service program was started in 1989.⁷

Table 1. Introduction of average milk yield and fertility on farms.

Farm	No. of cows	Milk yield kg	PP days	SI days	SP days	OI
A	277	6181**	121	74	47	2.0
B	204	5125**	134	75	59	2.3
C	231	5598	112	68	44	2.0
D	195	5411	126	78	48	2.0
E	246	5631	116	68	48	1.9
Total	1153	5630	125	73	52	2.1

**P < 0.05
PP = calving to conception interval
SI = calving to first service interval
SP = first service to conception interval
OI = services/conception

Significant differences in average milk yield of cows between farms exist. The average duration of calving to conception interval (126 days) indicates fertility problems in the herd.

Only 35.3% of all cows on farms were found without any disorders. Mastitis, lameness, retained placenta and endometritis represent 86.7% of all pathological incidents in the herd.

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Table 2. Frequency of different diseases on farm investigated.

	Number of diagnoses	%
Ketosis	16	1.39
Parturient paresis	13	1.13
Indigestion	36	3.12
Mastitis	485	42.06
Lameness	174	15.09
Retained placenta	195	16.91
Endometritis	276	21.66
Cystic ovaries	19	1.65
Abortion	41	3.56
Stillbirth	52	4.51
Healthy cows	407	35.30

Table 3. Influence of farm, lactation number and diseases on milk yield (statistical analysis).

Milk yield in whole lactation			
	d.f.	F-test	Sig.
Farm	4	12.47	***
Lakt. No.	5	13.63	***
Diseases	7	2.14	*

*** P < 0.01

* P < 0.05

By statistical analysis a significant influence of farm, lactation number and diseases on milk yield was demonstrated.

Differences in fertility parameters were found in cows with different disturbances and in comparison to healthy cows (Table 5). Ketosis, retained placenta, endometritis, cystic ovaries and abortion have a major negative influence on the duration of calving to conception interval. Due to high variability and irregular frequency distribution of all fertility parameters after simple statistical analyses, no significant differences were found. Similar opinions are very often presented.⁶

Conclusions

From this investigation, it can be concluded that milk production in herds analyzed was significantly reduced in cases of mastitis, retained placenta and abortion. Higher milk yield was a risk factor for the appearance of ketosis and parturient paresis. The study also confirmed the association between diseases and reproductive disorders exposure and fertility in dairy cows. Results are in accordance with the number of cited studies and support the economical implementation of herd health service program on respective farms.

Table 4. Milk yield in standard lactation - kg (305-d) according to different diagnoses.

	Milk yield 305- d kg	SD+	t-test	sig.
Ketosis	6232	1300	2.40	*
Parturient paresis	6469	1553	2.8	*
Indigestion	5053	1658	-0.97	NS
Mastitis	5113	1625	-2.64	**
Lameness	5147	1620	-1.27	NS
Retained placenta	5018	1524	-2.53	*
Endometritis	5287	1497	-0.10	NS
Cystic ovaries	5400	1923	0.30	NS
Abortion	4768	1568	-2.13	*
Stillbirth	4937	1428	-1.65	NS

** P < 0.05

* P < 0.01

Ketosis and parturient paresis were significantly associated with higher milk yield and mastitis, retained placenta and abortion with significantly lower milk yield in cows. High variability in milk yield of cows and low number of some diagnoses probably limit the demonstration of their influence on milk yield.

Table 5. Fertility parameters according to different diagnoses.

	SI days	SP days	PP days	services/ conception	conception rate
Ketosis	56	65	141	2.13	46.9
Indigestion	72	55	127	2.23	44.8
Mastitis	73	43	116	1.97	50.8
Lameness	70	46	116	2.01	49.8
Retained placenta	79	55	135	2.22	45.0
Endometritis	82	55	137	2.28	43.9
Cystic ovaries	83	61	144	2.39	41.8
Abortion	65	69	134	2.41	41.5
Stillbirth	66	55	121	2.30	43.5
Average	73	53	126	2.15	46.5
Healthy cows	63	40	103	1.88	53.2

SI - calving to first service interval

SP - first service to conception interval

PP - calving to conception interval

Summary

The data out of 1153 lactations in Friesian dairy cows have been used to study the frequency of different diseases and reproductive disorders on five large dairy farms in Slovenia. The connections between diseases, reproductive disorders and cow's milk yield and fertility were also examined. The average milk yield in the examination period was 5631±1775 kg of milk per cow. Mastitis was found in 42.1%, lameness in 15.1%,

metritis in 23.9% and retained placenta in 16.1% of lactations. These four disorders represented 86.7% of all pathological findings in the herd. A significant influence of farm, lactation number and diseases on milk yield was established. Ketosis and parturient paresis were associated with higher milk yield and mastitis, retained placenta and abortion with lower milk yield in cows. The dairy cow's fertility was negatively influenced by different diseases and especially by reproductive pathological disorders.

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Abstract

Leptospira hardjo - A brief summary of some points

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Leptospira hardjo is found world-wide and has been identified as a cause of bovine abortion and milk drop. In man infection may result in flu-like illness.

Leptospira hardjo infection of cattle gives rise to a bacteriemia that persists until antibodies to *L. hardjo* appear in the blood. This occurs about ten days after infection. Following the appearance of antibodies leptospirae may remain in certain sites of the body e.g. kidney, male and female reproductive tract and central nervous system. Renal excretion begins about three weeks after infection and may persist for a variable period ranging from months to years. *L. hardjo* is also excreted via the milk in the acute phase of infection. The persistence of antibody in the blood of infected animals cannot be related to renal excretion. Seronegative animals may excrete *Leptospira*, while seropositive animals may not excrete *L. hardjo* in urine.

Milk drop occurs during the acute phase of infection. Clinical signs are of a sudden fall in milk production with a soft pliant udder, all quarters affected. Any milk produced is colostrum like with a high cell count, and may be blood tinged. Diagnosis can be based on clinical signs with paired serology showing seroconversion and appropriate differential diagnosis.

Abortion occurs one to three months post-infection.

Serological diagnosis more difficult as titres may be static or falling.

L. hardjo infection may be transmitted via the following routes: venereal, milk during the acute phase, transplacental, products of abortion/calving, and urine.

The effects of vaccination on *L. hardjo* infection is to limit the replication of the organism and thus prevent the clinical signs of milk drop. The effects of vaccination and abortion are more complex as work carried out in the USA has shown that vaccinated pregnant animals challenged by a natural route developed *Leptospira* infection of the fetus. However, it may be that by reducing the bacterial replication the size of challenge to fetus is reduced and in this way clinical protection is achieved.

L. hardjo in man has an incubation period of one to two weeks with a biphasic pattern. Initially a sudden onset of fever occurs with severe headache and myalgia, signs then regress. The second phase occurs with temperature rise and in some cases may develop jaundice, renal failure or meningitis. Death is rare and results from hepatorenal failure. The number of human cases confirmed annually by PHLS Reference Laboratory between 1985-92 has ranged from ten to forty.