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Welfare in Danish Dairy Herds 1. Disease Management Routines in 1983 and 1994

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Alban, L. and J. F. Agger. Welfare in Danish dairy herds 1. Disease management routines in 1983 and 1994. Acta vet. scand. 1996, 37, 49-63. – This paper presents the first part of a questionnaire survey carried out in 2148 Danish dairy herds during 1994, as well as results from a similar survey carried out in 1983 The welfare status in Danish dairy herds with respect to disease management routines currently applied is discussed In detail this was recording of mastitis incidents, use of veterinarian for milk fever cases, farmer's effort in reducing incidence of mastitis, milk fever, ketosis, calving problems, and lameness, as well as frequency of claw trimming, reasons for culling, and way of replacing cullings Furthermore, trends during the 11 year period are discussed The results show that the Danish dairy farmers in 1994 in general have a substantial knowledge of prevention and treatment of disease. However, adjustments in the following areas would be appropriate 1) farmers should avoid making intravenous infusions, 2) they should be encouraged to use calving boxes for parturitions, 3) there should be more attention on claw health, and 4) to comply with the new Danish legislation, antibiotic dry cow treatment should only be carried out on the individual cow if pathogenic microorganisms have been isolated within 35 days prior to drying off.

dairy cow; care; descriptive epidemiology; cattle; animal welfare; farm management; disease prevention; questionnaires; surveys.

Introduction

During the last decades, the disease pattern among dairy cows has changed from mainly diseases of highly contagious nature to mainly multifactorial production diseases of non-infectious nature or caused by potential pathogens. These diseases cannot be eliminated without major changes in the production system. But if the predisposing factors are not rectified, disease will soon recur. However, this may not be economical feasible, and farmers therefore accept a certain disease level, mainly controlled by treatment and culling. It is widely accepted that management routines are associated with production diseases. There is little evidence, though, on management procedures in general and about their actual impact on disease. It is difficult to obtain valid information about these routines, but one way is by means of questionnaire surveys.

Simonsen (1993) defined welfare to be the sum of positive and negative experiences that an animal has. As examples of substantial negative experiences *Simonsen* (1993, 1996) stated pain, fear, and frustration, and as examples of substantial positive experiences joy, play, and satisfied expectations. By being associated with pain and discomfort, production diseases like mastitis, milk fever, ketosis, lameness, and re-

productive disorders are substantial problems that affect the cows' welfare.

The aim of the present paper is to discuss the welfare status and trends in the development in Danish dairy herds in 1994 with respect to currently applied disease management routines related to dairy cow welfare. Results from a questionnaire survey carried out in 2148 Danish dairy herds in Ringkøbing County, Funen County, and around the city of Brørup in the Southwest of Jutland, as well as results from a 1983 survey are presented. Housing systems, grazing routines and welfare are dealt with in another paper (*Alban & Agger* 1996), and health management and other general routines in a third paper (*Agger & Alban* 1996).

The present questionnaire survey was carried out as a part of the research project "Welfare in dairy cows" funded by the Danish Ministry of Agriculture.

Materials and methods

This publication and the publications by *Alban & Agger* (1996) and *Agger & Alban* (1996) are based on 2 data sets collected in 1983 and in 1994. The results from the 1983 study, which was carried out by the second author, will be given in the text. From the 1994 study the results will primarily be in the tables. The results of the 2 surveys will be compared to each other and to a large survey carried out in 1988 (*Anon* 1988), and trends during the 11 year period will be discussed. Furthermore, the results of the 1994 survey will be compared to the general recommendations for cattle keeping.

The 1983 study

A case control study in Danish dairy herds with the aim to identify environment and management risk factors for high somatic cell count (≥500,000 cells per ml) vs. low somatic cell count (<500,000 cells per ml) in bulk tank milk was undertaken in 1983. Data about 282 environment factors with regard to details in housing design, hygiene, climate, milking and milking machine were collected by 2 dairy technicians. Information about 400 management variables with regard to herd structure, occurrence of disease, culling procedures, working routines, methods of production control and disease surveillance, drying off and other milking procedures, feeding, working hours and manpower, and personal information was collected at a personal interview with the farmer by one veterinarian. Only information on tie stall herds and variables corresponding to those included in the 1994-study will be presented here.

Due to the case control sampling, estimates for the population parameters were calculated under the assumption that the case herds and control herds were representative for their respective subpopulations with regard to environment and management patterns. The estimates were adjusted for the respective sampling proportions of the case and control herds in the study area, i.e. East Denmark. The total study population included 1659 tie stall dairy herds including 79 case herds and 1580 non case herds identified during a 9 months period. The samples included 75 case herds and 77 of the non cases. The distribution of factor categories in the samples were weighted as follows: Case herds: 79/1659 = 0.05; Control herds: 1580/1659 = 0.95. The population estimates were therefore calculated for each variable under study as:

$$P_{pop}(\text{category}_i \text{ of the factor}) = \Sigma\,(0.05 \times \text{prob category}_i|\text{case} + 0.95 \times \text{prob category}_i|\text{control})$$

where. $i = 1,2, \ldots, k$ factor categories.

The 1994 study

A questionnaire was designed to obtain information on housing, grazing, work load, replace-

ment of animals, and prevention, treatment and recording of disease. The questionnaire can be obtained from the authors upon request.

The Danish Agricultural Advisory Center cooperated in the selection of the study herds and provided the names and addresses of the dairy producers. All dairy herds belonged to 1 of the 3 areas: Ringkøbing County, Funen County, or around the city of Brørup in the Southwest of Jutland. The dairy farmers and veterinarians in those regions were the first in Denmark to implement the Central Danish Disease Recording Scheme. They therefore had most experience with disease recording. The selection criterion was that the herd should have reported a minimum of 0.05 cases of mastitis per cow per year to the Central Danish Disease Recording Scheme. This assured exclusion of herds in which disease recording did not function. Information about disease occurrence was needed since another aim of the study was to investigate the association between disease, housing, management, and production.

An introductory letter was mailed to the farmers explaining the purpose of the survey. The letter informed the farmer that he would be contacted by telephone by a student from The Royal Veterinary and Agricultural University and asked questions about the dairy herd. A few days later, the farmer was contacted by the student and the interview was carried out. A total of 22 pretrained students conducted the telephone interviews which each lasted 15- 45 min. Initially, a limited test survey was carried out in December 1993 and January 1994 in 65 randomly selected herds in Ringkøbing County and Funen County. All identified errors and misunderstandings were corrected in the final questionnaire. The interviewers were instructed to phrase the questions, exactly as they were written every time they conducted an interview. The interviews were carried out from February to September 1994.

Figure 1 The farmer is applying cuppersulphur ointment on a claw. This is an example of the farmer's effort to prevent or treat lameness

The data were filed as a SAS-dataset (*SAS Institute Inc.* 1987). All interview forms were controlled for coding errors by visual inspection, and the SAS-data file was then proof read by comparison to the original questionnaire forms.

A total of 2391 farmers were contacted, but 57 herds could not be reached by telephone. 186 were contacted but refused to be interviewed. The stated reasons for refusing to participate varied. Some farmers had just sold or were about to sell their cows. A few of the farmers had died, and their wives did not want to participate. Some were too busy or did not speak Danish. And some did just not like to participate in the survey. Hence, a total of 2148 inter-

views were carried out, yielding a 89.8% response rate. This is a high response rate, so the results are considered representative of the population in the 3 areas and very likely to the rest of Denmark. The interviews were performed with the husband in 91.2% of the herds, with the wife in 5.6%, and with the farm hand in 3.2% of the herds. A simple cross tabulation showed that the interviews were performed with a person different from the one primarily taking care of the cows in 10.1% of the herds. This may have lead to a few information biases. All variables were stratified for type of housing because housing is known to impact strongly on management procedures. Fifteen herds with mixed types of cattle houses were excluded from the analysis, i.e. the results are based on 2133 dairy herds. In case there was a significant association between a variable and type of housing, this is stated. In case of no significant association, the tables were collapsed across type of housing. The statistical evaluation was done by use of Chi-square test and Pearson standardized residual analysis (*Christensen* 1990).

Results

1983 study

In the 1983 survey in tie stall herds, 35.5% of the farmers did nothing to prevent mastitis. They only called the veterinarian for therapy. More frequent milking was done by 58.1%, warm soap bath or liniment was applied by 29.5% of the farmers, and 5.5% stated that they massaged the udder. 22.9% of the farmers dipped all cow teats daily, 64.9% never dipped teats, and 12.2% dipped infrequently. 8.0% of the farmers daily dipped the teats of the dry cows. The farmers evaluated the occurrence of lameness on a 9-grade scale. Lameness was seldom (grade 7-9) observed in 80.3% of the herds, while 7.7% observed lameness very frequently (grade 1-3), and 12.0% less frequently (grade 5-6). Regarding frequency of trimming, 14.2% of the herds never had the cows claw trimmed, 50.7% had all cows trimmed once a year, 9.0% twice a year, and 21.2% only had a few cows in need trimmed. The rest used other routines. Regarding dry cow treatment, 43.5% never used intramammary antibiotic treatment of the dry cows, 53.5% used selective therapy, and only 2.8% treated all cows. The 6 major reasons to cull a cow were: low yield (71.1%), disease (66.4%), not pregnant (57.3%), pregnant heifers waiting for space in the cow stall (40.1%), age (16.5%), and bad temper of cow (15.4%). Culled cows were replaced by own stock in 75.5% of the farms, while 12.7% only bought heifers from other herds or from a market place, and 11.8% purchased both heifers and cows from outside.

1994 study

In the majority of the farms (88.9%) all incidents of mastitis were apparently reported to the Central Danish Disease Recording Scheme (Table 1). 18.1% of the farmers would deal with a part or all cases of milk fever in their herd (Table 2). Significantly more deep bed farmers treated more than 50% of the milk fever cases

Table 1. Number of farmer-observed incidents of mastitis within the past 30 days of the interview which were not reported to the Central Danish Disease Recording Scheme

Number* of incidents which were not reported	No	%
0 (All incidents reported)	1897	88.9
1- 5	153	7.2
6-10	11	0 5
> 10	2	0 1
Did not answer or did not remember	70	3.3
Total	2133	100

*. the data are not adjusted for herd size.

Table 2 Use of veterinarian in case of milk fever by the type of housing system.

Proportion of incidents of milk fever that the farmer would deal with himself	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%	No	%	No	%	No	%
The veterinarian deals with all cases	1546	82.5	150	77 7	43	66.2	1739	81.5
Farmer deals with <50% of the cases	148	7 9	18	9.3	7	10.8	173	8.1
Farmer deals with 50%–99% of the cases	126	6.7	19	9.8	12*	18 5	157	7.4
Farmer deals with all cases himself	47	2.5	6	3.1	3	4 6	56	2.6
Did not answer	8	0.4	0	0.0	0	0.0	8	0.4
Total	1875	100	193	100	65	100	2133	100

*: $p<0.001$.

themselves compared to tie stall farmers or farmers with cubicle houses ($p<0.001$) (Table 2).

The farmers were asked which routines they carried out to prevent or treat 5 different diseases: mastitis (Table 3), milk fever (Table 4), ketosis (Table 5), dystocia (Table 6), and lameness (Table 7). More than 1 answer could be given. The answers to each question are presented as the number of farmers stating the routine, and the percentages are calculated as the number of positive responses divided by the total number of farmers. In this way, the sum of percentages will usually be higher than 100. Procedures to prevent or treat mastitis were commonly used (Table 3). To prevent milk fever, oral administration of calcium was commonly used (Table 4). To prevent ketosis (Table 5), tie stall farmers had higher use of glycerol or other glucogenic substances than farmers with the other housing systems. Regarding prevention of dystocia (Table 6), extra litter was used by more tie stall farmers than by farmers with the other types of cattle houses. A straw bale behind the cow at calving was almost only used in tie stall houses. A calving box was used much more frequently in cubicle houses than in the other types of houses.

More farmers with cubicle houses would claw trim the cows compared to farmers with the

Table 3. Mastitis – The farmers' procedures for prevention and treatment.

Farmer's prevention or treatment procedure	No.	%[1]
Liniment, oil, soap bath a.o.	1239	58.1
Massage and milking the udder	724	33.9
Disinfection of udder or floor	488	22.9
Prevention against summer mastitis	16	0.8
Used antibiotics himself	50	2.3
Did nothing or did not answer	405	19.0

[1] Percentages were calculated as the number of positive answers divided by the number of farmers, which was 2133.

Table 4. Milk fever – The farmers' procedures for prevention and treatment.

Farmer's prevention or treatment procedure	No	%[1]
Oral administration of calcium	1510	70.8
Subcutaneous adm. of calcium and feeding strategy	154	7.2
Intravenous administration of calcium	79	3.7
Did nothing or did not answer	478	22.4

[1] Percentages were calculated as the number of positive answers divided by the number of farmers, which was 2133.

Table 5. Ketosis – The farmers' procedures for prevention and treatment of ketosis by the type of housing system.

Farmer's prevention or treatment procedure	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%[1]	No	%	No	%	No	%
Glycerol & glycerol-like substances	240*	12.8	17	8.8	3	4 6	260	12.2
Other glucogenic substances	511*	27.3	28	14.5	11	16.9	550	25.8
Feeding strategy, post treatments, or did not have ketosis	485	25 9	56	29.0	17	26.2	558	26.2
Did not answer	835	44.5	105	54 4	35	53.8	975	45.7

[1] Percentages were calculated as the number of positive answers divided by the number of farmers. This was 1875 tie stall farmers, 193 cubicle house farmers, and 65 farmers with deep bed house, in total 2133.
*: Apparent difference between housing systems, but not based on a statistical test

Table 6. Dystocia – The farmers' procedures for prevention and treatment by the type of housing system.

Farmer's prevention or treatment procedure	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%[1]	No	%	No	%	No	%
Pulling out or turning calf	1470	78.4	157	81.3	47	72.3	1674	78 5
Use of calving box	527	28 1	123*	63.7	17	26.2	667	31.3
Extra litter for the cow	591*	31 5	28	14 5	10	15.4	629	29.5
Wooden platform or straw bale behind the tethered cow	420*	22.4	3	1.6	0	0.0	423	19 8
Use of pulling machine	58	3.1	3	1.6	1	1.5	62	2.9
Removal of placenta	34	1.8	8	4.1	1	1.5	43	2.0
Other procedures	51	2.7	15	7.8	2	3 1	68	3.2
Did nothing or did not answer	109	5.8	7	3.6	2	3 1	68	3 2

[1] See foot note of Table 5.
* Apparent difference between housing systems, but not based on a statistical test.

other housing systems (Table 7). The farmers were asked how many per cent of the cows had been lame during the last year. However, since the farmers' statements are based on memory, these are only rough statements (Table 8). There were more "no-cases" among tie stall herds than among the other types of cattle houses ($p = 0.01$), while the cubicle house herds had a higher proportion ($p<0.001$) and the tie stall herds a lower proportion ($p = 0.018$) of herds with frequent incidents of lameness. Only in 4.3% of the herds was claw trimming seldom or never carried out (Table 9). Cows in zero-grazing herds were claw trimmed more often than cows in summer grazing herds ($p<0.014$) (Table 10). A total of 75.6% of the farmers had all cows trimmed whenever they called the claw trimmer, and 21.8% only trimmed those with problems or those that had calved recently. In all 3 housing systems dry cow therapy was commonly used for selected cows. More cubicle house farmers ($p<0.001$) used dry cow therapy for all cows than farmers with the other housing systems (Table 11). The farmers were asked about the most common reasons to cull a cow. Each farmer could give several answers.

Table 7. Lameness – The farmers' procedures for prevention and treatment by the type of housing system

Farmer's prevention or treatment procedure	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%[1]	No	%	No	%	No	%
Call the ferrier	840	44.8	68	35.2	19	29.2	927	43.5
Farmer might trim the claws himself	307	16.4	79*	40.9	15	23 1	401	18.8
Liniment, oil or soap bath	155	8 3	13	6 7	3	4.6	171	8.0
Soft bedding or other procedures	78	4.2	19	9.8	4	6.2	101	4.7
Did nothing or did not answer	638	34.0	43	22.3	30	46.2	711	33.3

[1] See foot note of Table 5.
* Aparrent difference between housing system, but not based on a statistical test.

Table 8. Incidence risk of lameness during the last year at the herd level by the type of housing system

Incidence risk of lameness	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%	No	%	No	%	No	%
No cases in the herd	645*	34.4	17	8.8	8	12 3	670	31.4
Infrequent (0%<×<5%)	582	31 0	53	27 5	27	41.5	662	31.0
Frequent (5%≤×≤20%)	579*	30 9	111*	57 5	28	43.1	718	33.7
Widespread (>20%)	51	2 7	10	5 2	2	3.1	63	3.0
Could not remember or did not answer	18	1.0	2	1.0	0	0.0	20	0.9
Total	1875	100	193	100	65	100	2133	100

*. p≤0.018

(Table 12). There was a substantial difference for lameness as a reason for culling: highest among farms with cubicle houses, next-highest among tie stall farms, and lowest among farms with deep bed houses. Significantly more farmers with deep bed houses would buy a part of or all animals from outside than farmers from the other housing systems (p<0.001) (Table 13).

Discussion

Recording of mastitis

Apparently, the majority of mastitis incidents was reported in 1994 (Table 1). Many other diseases are probably not recorded as eagerly. The withdrawal time of the milk from a cow treated with antibiotics, and the penalty for a farmer who delivers milk with antibiotic residues, may be reasons why mastitis probably is one of the diseases which is being recorded most reliably. A reliable disease recording is important for causal research, e.g. for the purposes of sire selection in breeding programmes, and for the veterinarian's advice in herd health management.

Table 9. Frequency of claw trimming.

Claw trimmings per year	No	%
Seldom or never	91	4 3
1-<2	730	34.2
2-<3	912	42 8
3-<4	112	5.3
4	50	2 3
Not specified	238	11.2
Total	2133	100

Table 10. Frequency of claw trimming in zero-grazing herds and summer grazing herds Only herds, which reported that the majority (≥60%) of the cows were trimmed at each trimming, were included.

Claw trimmings per year	Summer grazing		Zero-grazing		Total	
	No	%	No	%	No	%
Seldom or never	16	1 5	1	0.3	17	1.2
1-<2	502*	46.8	73*	21.5	575	40 7
2-<3	489*	45 6	225*	66.2	714	50 6
3-<4	39*	3.6	34*	10.0	73	5 2
4	9	0.8	6	1 8	15	1 1
Not specified	17	1 6	1	0.3	18	1 3
Total	1072	100	340	100	1412	100

*: p≤0 014.

Table 11. Pattern of intramammary dry cow therapy by the type of housing system.

Dry cow therapy	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%	No	%	No	%	No	%
Never	311	16.6	34	17.6	17	26 2	362	17.0
A few, <40%	1239	66.1	109	56.5	37	56 9	1385	64.9
Several, 40%≤×<67%	103	5.5	9	4.7	2	3.1	114	5.3
All cows ≥67%	220	11 7	41*	21 2	9	13 9	270	12.7
Did not answer	2	0 1	0	0.0	0	0 0	2	0 1
Total	1875	100	193	100	65	100	2133	100

*: p≤0.001.

Table 12 Distribution of farmers' reasons for culling a cow by the type of housing system

Reasons for culling a cow	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%[1]	No	%	No	%	No	%
Udder-diseases	1186	63.6	123	63.7	32	50.0	1341	63 2
Reproduction problems	1053	56.5	82	42.5	32	50.0	1167	55 0
Low yield	747	40.1	97	50.3	36	56.3	880	41.5
High somatic cell count	392	21.0	41	21.2	12	18.8	445	21.0
Lameness	292	15 7	57*	29.5	3	4.7	352	16 6
Age	180	9.7	21	10.9	8	12.5	209	9.8
Other diseases	70	3.8	9	4.7	5	7.8	84	4.0
Temperament	67	3.6	8	4.1	1	1.6	76	3.6
Udder conformation	43	2.3	3	1.6	1	1.6	47	2.2
Other reasons	38	2 0	7	3.6	1	1.6	46	2 2

[1] Percentages were calculated as the number of positive answers divided by the number of farmers This was1865 tie stall farmers, 193 cubicle house farmers, and 64 farmers with deep bed house, in total 2122.

*: Apparent difference between housing systems, but not based on a statistical test.

Table 13. Sources of replacement animals by the type of housing system

Farmer replace animals	Tie stall house		Cubicle house		Deep bed house		Total	
	No	%	No	%	No	%	No	%
Only from own stock	1647	87.8	176	91.2	50	76.9	1873	87 8
Both from own stock and through buying	180	9 6	15	7.8	9	13.8	204	9 6
Only through buying	48	2 6	2	1 0	6*	9 2	56	2.6
Total	1875	100	193	100	65	100	2133	100

*. p≤0.001.

When to call the veterinarian for treatment of milk fever

In one fifth of the 1994 herds, not all cases of milk fever were treated by a veterinarian (Table 2). This can probably be explained by the following: a skilled farmer is able to distinguish between a mild and a severe case of milk fever. He may deal with the mild case, and leave the severe to the veterinarian. The relatively high proportion of deep bed farmers who dealt with more than half of the milk fever cases might be explained by generally milder cases of milk fever in deep bed cows, either due to lower level of milk production or due to a better resistance against milk fever, compared to tie stall cows or loose housed cows. It may also be a result of a more common use of preventive measures among these farmers. Finally, grazing may be a confounder, e.g. *Gustafson* (1993) found that grazing cows were at lower risk of milk fever and recovered sooner than zero-grazed cows.

Farmer's routines to prevent or treat disease

Mastitis: The high concern for preventing mastitis, which was seen both in the 1983 survey and in the 1994 survey (Table 3), may probably be explained by the withdrawal period for the milk associated with an antibiotic treatment of the udder. Some farmers prefer to deal with the mild cases by use of liniment, oil, soap bath, or milking the udder more frequently, and restrict antibiotic treatment for the more severe cases. The number of farmers who stated that they applied antibiotics for mastitis treatment may be higher than the stated 2.3%, because a change in the Danish regulations regarding this subject was expected in 1994. The new law came into act on June 1st, 1995 and permits farmers to do antibiotic follow up treatment after an initial treatment by a veterinarian. In return, the farmer has to enter a formal health agreement including 12 yearly consulting visits to the farm by the veterinarian (*Anon.* 1995a). From a welfare point of view, the high interest in preventing mastitis is positive.

Milk fever – Milk fever occurs as a result of mineral imbalances, mainly due to too low levels of plasma calcium, and there are several approaches to prevent this, see e.g. *Jönsson* (1978) and *Horst et al.* (1994). One approach is oral administration of calcium gel at the time of parturition. This was commonly used by the Danish farmers in 1994 (Table 4). It is a prolonged, but slow treatment, and which is easily overcome by the farmers. Only 3.7% of the farmers stated that they infused calcium preparations intravenously. According to the new Danish law on drugs for veterinary use, which came into act on June 1st, 1995, intravenous infusions are now restricted to be used only by the veterinarian (*Anon.* 1995b). One reason for this is that severe tissue damage may occur if the infusion is not carried out properly, and if the cal-

cium preparation is given too quickly, heart block may occur (*Phillips* 1982). Hence, infusions should be given by skilled personel.

Ketosis – Ketosis is a disease usually related to the feeding of cows (*Baird et al.* 1974, *Baird* 1982, *Eddy* 1992). It was therefore interesting to note that one quarter of the 1994 farmers stated that they never had ketosis or that they prevented it through feeding (Table 5). Administration of glycerol and other glucogenic substances were also commonly used to prevent ketosis. Tie stall farmers had the highest use of glycerol or other glucogenic substances, and this may be explained by a better opportunity to administer a drug to a tied cow compared to a not-tied cow. Another explanation is that loose housed cows might have a reduced incidence of ketosis compared to tied cows (*Ekesbo* 1966, *Bendixen et al.* 1987). From a welfare point of view, prevention must be the optimal situation.

Dystocia – Calving boxes were only commonly used in the cubicle houses (Table 6). The use of a calving box may give a more relaxed parturition and a better start in life for the newborn calf. But the farmer has to give colostrum to the newborn calf since a calving box in itself does not assure this (*Jonasen & Krohn* 1991; *Edwards* 1982). The cow goes through a metabolic change at parturition, which may predispose it to several diseases, among these milk fever, ketosis, lameness, cystic ovaries, and mastitis. A calving box providing free movement may reduce the risk of the cow developing disease, e.g. *Krohn et al.* (1990) found that leaving the calf with the cow for 5 days resulted in a 2-2.5 times lower incidence of mastitis. They also found that "the cow's physical behaviour was more normal when the cow and calf were together". At current, the National Committee on Danish Cattle Husbandry works on a set up of recommendations regarding cattle keeping. Regarding parturitions during the housing season, the temporary recommendation is to separate calving animals from the other animals, i.e. by use of a calving box, at the latest two days before parturition (*Thøgersen*, 1995). Use of a pulling machine was not very common in 1994. According to the Danish law it is prohibited to use a pulling machine to assist in parturition, unless, as recommended by the Danish Veterinary Health Board, the pulling capacity is less than 165 kg, which equals the weight of 2 persons (*Paulsen* 1994).

Lameness – Routines to prevent or treat lameness were not commonly used (Table 7). The low effort seen may be interpreted as a low interest in lameness from the farmers in general. Another explanation is that many cases of lameness have a silent onset which makes diagnosing difficult. A third explanation is that only few farmers have a claw trimming box which is almost essential in case the farmer wants to trim the claws himself. The larger proportion of cubicle farmers who would claw trim themselves may be related to the presence of extra personel on these farms (*Agger & Alban* 1996). The proportion of 1994 farmers who stated that they would trim the claws themselves is twice the number of what was found in a similar study in 1981 (*Anon.* 1982) and in the 1983 survey. This may be explained by an increasing interest in prevention of lameness among some farmers. Presuming the farmer is acquainted with proper claw trimming, there should be no welfare implication in his claw trimming of own animals. From a welfare point of view, attention on claw health is important, since the majority of claw diseases are associated with substantial pain or discomfort and are of long duration, and hence, have a large impact on the affected animals' welfare.

Incidence of lameness during the last year
It is not possible to compare directly to the results of the 1983 survey because another grading was used in the 1983 survey compared to the 1994 survey. The lameness incidence seen in the 1994 survey (Table 8) is higher than the results of a survey made in 1981 where no cases were seen in 11% of the herds, 75% had cases infrequently, and 13% had cases frequently *(Anon.* 1982). The same range of percentages were used in both surveys: infrequent was equal to $0\% < \times < 5\%$, and frequent $5\% \leq \times \leq 20\%$. In the 1994 survey, the tie stall herds stated the lowest, and the cubicle herds the highest frequency of lameness. This is somewhat in agreement with *Frankena et al.* (1992 & 1993) who found that calves in deep bed houses had the lowest incidence of sole haemorrhages and dermatitis interdigitalis, and calves in tie stall houses second-lowest, compared to calves kept on slatted floors. *Rowlands et al.* (1983) found that cows in deep bed houses had lowest incidence of lameness and cows in tie stall houses second-lowest, compared to cubicle housed cows. The difference between the present study and the studies by *Frankena et al.* and *Rowlands et al.* may be related to confounding factors like breed and herd size. Again, it should be mentioned that lameness has a major impact on the affected animals' welfare. Therefore, in herds with a high incidence of lameness, the causal mechanisms should be investigated and means to reduce the incidence should be taken.

Claw trimming
In a survey from 1988, 13% of the farmers seldom or never had the cows claw trimmed. 38% used trimming once a year, and 49% used trimming more than once a year *(Anon.* 1988). The difference between the 3 surveys may indicate that the farmers were more aware of claw trimming in 1994 as compared to 1983, but no change has probably taken place since 1988. Claw trimming reduces the number of clinical cases of lameness (e.g. *Manson & Leaver* 1989). It seems like the Danish dairy farmers are aware of this beneficial effect, since only a few farmers seldom or never had the cows claw trimmed (Table 9). Analysis for the association between trimming frequency and grazing procedure shows that claw trimming was carried out more often in zero-grazing herds than in summer grazing herds (Table 10). This confirms that cows wear their claws when grazing. Claws need trimming, but the wear and growth depend on several factors such as breed, level of milk yield, whether the cows graze (and if they graze, the hardness of the field), hardness of stall floor, and presence of rubber mats. *Blowey* (1993) and *Toussiant Raven* (1985) recommended that all claws should be examined and the neccessary claws trimmed at drying off. This may reduce the risk of the cow developing lameness after parturition. *Toussiant Raven* (1985) also recommended claw trimming in the autumn as a preparation for the housing period.

Antibiotic treatment at drying off
Use of intramammary antibiotic treatment of all dry cows was not common in 1994 (Table 11). However, the response also indicates that it was common to do selective treatment. In the 1988 survey approximately 50% of the herds either used selective treatment or treated all cows at drying off. Hence, since 1983 it has become more common to use antibiotic dry cow treatment in tie stall houses and probably also in the other housing systems. The relatively high use of dry cow treatment for all cows which was seen in the cubicle farms cannot be explained directly and has to be investigated further. According to the new Danish law on drugs for veterinary use, antibiotic dry cow treatment on the individual cow should only be carried out in case pathogenic microorganisms have been isolated within 35 days prior to drying off (*Anon.*

1995b). The intention of this part of the law is to restrict the preventive use of antibiotics, and hence, to minimize the development of antibiotic resistence and occurrence of drug residues in meat and milk.

Reasons to cull a cow

Table 12 should be read with the fact in mind that diseases interrelate. Diseased claws may e.g. result in teat tramp, and when the farmer decides which cow to cull, he may only notice the teat tramp and not the lameness that provoked the teat tramp. However, *Agger* (1981) did not find any clear association between claw lesions and teat lesions. The difference between the tie stall house and the loose house regarding the importance of lameness as a reason for culling was also seen by *Krogh Hansen* (1986). But *Krogh Hansen* did not distinguish between deep bed houses and cubicle houses, most likely because deep bed houses were not common in Denmark in 1986. *Christensen et al.* (1984) found, in a Danish study lasting from 1972-1980, that the most common reasons for culling were (listed after order of importance): reproduction, low yield, udder-related problems, and lameness. *Dohoo & Martin* (1984) and *Milian-Suazo et al.* (1988) also found that the most common reasons for culling were low yield, reproduction problems and udder-diseases. It seems like udder-diseases have a greater impact in the Danish herds today, compared to the 1970s and 1980s. This might be a result of the increase in average yearly milk yield that has occurred in the same period. The average milk yield for a Danish Holstein-Friesian cow was 5528 kg in 1980 and 7245 kg in 1992 – an increase of 31% (*Klejs Hansen* 1993).

Replacement of animals

In general, buying animals was not common in 1994 (Table 13). The deep bed house herds had the highest proportion of farmers who bought a part or all replacement animals. This may be explained by the fact that the deep bed house is a relatively new housing system in Denmark. Hence, some of these farmers may have started their farms recently and had no other possibility to get new animals than purchasing. Buying a heifer or a cow from a market or directly from another farm is always associated with a risk of introducing disease to the herd, e.g. Bovine Virus Diarrhoea or Paratuberculosis. As an example, *Agger et al.* (1994) found that buying cattle was associated with an increased risk of introducing *Streptococcus agalactiae*. It seems like the farmers were more aware of the risk of introducing disease into the herd in 1994 compared to 1983.

Advantages with the questionnaire approach

Data in epidemiological studies of dairy farm management are often collected by means of an interview or a questionnaire. This is because it is an easy and relatively cheap way of gathering information. Furthermore, a large number of observations can be collected. This may increase the similarity between the study population and the reference population, hence providing a high degree of representativeness.

Problems with the questionnaire approach

Information bias is a general problem with questionnaire data. It may for example occur if the interviewed person gives the answer which he thinks the interviewer would like to hear instead of the truth. To minimize this source of bias, all questions were phrased as value-free as possible. And all interviewers were instructed to phrase the questions neutrally and exactly as written on the interview form. The interviewers could introduce another kind of information bias which is misclassification bias. This would occur if the interviewer misunderstood the farmer. This source of bias was minimized by careful instruction and training of the inter-

viewers. The repeatability of questionnaire data can be assessed as described by *Schukken et al.* (1989). It is our intention to repeat the questionnaire in a subsample.

Conclusion

The results show that the Danish dairy farmers in 1994 in general have a substantial knowledge about prevention and treatment of disease. However, adjustments on the following areas would be appropriate: 1) farmers should avoid making intravenous infusions, 2) they should be encouraged to use calving boxes for parturitions, 3) there should be more attention on claw health, and 4) to comply with the new Danish legislation, antibiotic dry cow treatment should only be carried out on the individual cow in case pathogenic microorganisms have been isolated within 35 days prior to drying off.

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Sammendrag

Velfærd i danske kvægbesætninger 1 Sygdomsstyrings-rutiner i 1983 og 1994

Denne artikel præsenterer første del af et rundspørge udført i 2148 danske malkekvægsbesætninger i 1994 samt resultater af en lignende undersøgelse fra 1983 Status og udvikling gennem de 11 år kommenteres

for rutiner relateret til styring af sygdomme, såsom registrering af mastitis-tilfælde, brug af dyrlæge ved tilfælde af mælkefeber, ejerindsats ved mastitis, mælkefeber, ketose, kælvningsproblemer, klovproblemer, hyppighed af klovbeskæring, samt kriterier for udsætning og indsætning af nye dyr Resultaterne viser, at generelt set har danske mælkeproducenter i 1994 en betragtelig viden om forebyggelse og behandling af sygdomme. Ændringer på følgende områder vil dog være hensigtsmæssige 1) landmænd bør ikke udføre intravenøse injektioner, 2) landmænd bør opfordres til at bruge kælvningsboks i højere grad, 3) der bør være mere opmærksomhed på klov- og lemmesundhed, og 4) for at overholde den netop ændrede lovgivning bør goldko-behandling med antibiotika kun finde sted på den individuelle ko, såfremt patogene mikroorganismer er blevet isoleret indenfor 35 dage før goldning.

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