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NEWBORN CALF MANAGEMENT, MORBIDITY AND MORTALITY IN FRENCH DAIRY HERDS

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Une enquête a été réalisée dans 236 exploitations laitières de l'Ouest de la France en 1995/96 avec pour objectifs : (1) de décrire la conduite de l'élevage des veaux nouveaux-nés en regard des recommandations pour limiter les maladies et la mortalité avant sevrage, (2) de quantifier la morbidité et la mortalité des veaux au cours des 15 premiers jours de vie, (3) de classer les facteurs de risque présents dans les élevages selon leur poids dans l'expression de la morbidité. Les facteurs associés à une morbidité élevée (>20% des veaux vivants à 24 heures) ont été identifiés par régression logistique. Pour évaluer le poids des facteurs de risque liés à la conduite d'élevage, le risque relatif et la fraction attribuable dans la population ont été calculés pour les facteurs augmentant significativement la morbidité. Les taux moyens de mortalité au vêlage ou avant 24 heures, de mortalité entre 24 heures et 15 jours et de morbidité entre 24 heures et 15 jours sont respectivement de 6,5%, 3,1%, et 17,4%. L'absence de distribution précoce systématisée du colostrum (39% des élevages), l'absence de distribution d'eau (14%), le logement des veaux en cases collectives avec des âges hétérogènes (38%), et la non-séparation des veaux malades (71%) sont associés à des risques relatifs de plus de 2. La distribution aux veaux du lait des vaches atteintes de mammite (70%), l'apport d'eau non potable (7%), les contacts des veaux avec d'autres bovins (31%) ou l'introduction de veaux d'autres exploitations (29%) sont associés à des risques relatifs compris entre 1,5 et 2. Les facteurs ayant le plus fort impact dans la population sont la distribution du colostrum, l'utilisation du lait de mammite, le logement des veaux et la non-séparation des veaux malades. Ces facteurs doivent être considérés en priorité dans les plans de maîtrise de la santé des veaux.

INTRODUCTION

In dairy farms, control programmes for calf diseases have been proposed for many years to limit subsequent costs and losses. Nevertheless, recent studies in different countries reported mortality after birth and morbidity rates before weaning from 2 to 6% and from 25 to 50% respectively, indicating that major improvement was possible. Mortality occurs especially in the first week of life whereas morbidity is mainly due to diarrhea in the first to third weeks of age (Curtis et al., 1993, Olsson et al., 1993, Perez et al., 1990, Simensen and Norheim, 1982, Waltner-Toews et al., 1986, Wells et al., 1996). In French herds, rates described by Vallet (1996) in 1989/90 were 15.6% for 1 day to 1 month morbidity (including dead calves) and 5.5% for birth (excluded) to 15 month mortality, with large variations between herds (s.d. 15.2 and 5.2 respectively).

Many risk factors related to newborn calf management have been identified, and available control programmes rely mainly on prevention of exposure to risk factors, and on complementary medical control actions. Little is known on the actual level of exposure and implementation of control actions in French dairy farms. Quantification of the effects of risk factors and preventive measures is needed to determine which newborn calf management practices still have to be improved in priority in farms.

The objectives of this study were: (i) to describe newborn calf management compared to recommendations regarding diseases risk control, (ii) to quantify calf morbidity and mortality rates in French dairy farms and (iii) to rank present risk factors according to their contribution to morbidity in the herds.

MATERIAL AND METHODS

Data were collected in 1995/96 in 236 dairy farms in West of France (Pays de la Loire area). The study sample consisted in 60% herds randomly sampled among herds with at least 25 dairy cows, enrolled in the Milk Recording Scheme, and 40% herds conveniently sampled (based on feasability of data collection). Herd size and milk yield averaged 44 present cows and 7400 kg/cow-year.

Disease and death occurrences were recorded by farmers, and validated every month by vets or technicians. Description of calf management was obtained by an interview of each farmer and a farm visit carried out by trained investigators. A standardized questionnaire focused on risk factors which have been identified in previous studies and on control actions available to farmers.

Mortality at birth or before 24 h was calculated among all calves born. Mortality and total morbidity (diseased and/or dead) between 24 h and 15 days were calculated among calves alive at 24 h. To quantify the effects of risk factors and control actions, logistic regression models were run at the herd level with morbidity as dependent variable. Herds with morbidity rate over 20% were considered as cases whereas herds with morbidity rate up to 20% were considered as controls. Seasonal distribution of calvings, calving location, calving supervision and assistance, dystocia, colostrum feeding, milk and water feeding, calves housing, introduction of calves from other farms, surveillance of calves, medical prevention in cows and calves were set as independent variables. Herd characteristics (herd size, milk yield/cow and manpower) were included as adjustment variables. Backward selection of variables was based on the likelihood ratio test. Odds-ratios issued from final logistic regression model were derivated into relative risks (Martin et al., 1987). Population attributable fractions of risks factors increasing significantly morbidity between 24 h and 15 days were calculated according to Bruzzi et al. (1985).

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RESULTS

Mortality and morbidity rates showed large variations described in Table I.

Table I
Calf morbidity and mortality in 236 dairy herds in West of France in 1995/96

	mean	s.d.	p_{25}	median	p_{75}	p_{90}
Mortality at birth or before 24 hours	6.5	4.6	3.3	6.1	9.3	12.5
Mortality between 24 h and 15 days	3.1	4.4	0.0	1.7	4.2	8.8
Total morbidity between 24 h and 15 days	17.4	16.0	5.7	11.8	24.3	41.3

p_n: n-th percentile

Management practices for colostrum feeding, milk and water feeding, calf housing and cross-contaminations between calves or with other cattle were significantly associated with morbidity level (Table II).
Seasonal distribution of calvings, surveillance and assistance at calving, hygiene at calving were not related to morbidity. Farms with a high proportion of cows calving in the straw yard had lower morbidity, whereas high proportion of calving on pasture was associated with higher morbidity. Some risk factors were present in the farms but not associated with higher morbidity : hygiene in calf housing (insufficient in 41 % of the farms), hygiene for calf feeding (buckets cleaned less than once per day in 9% of the farms), housing facilities with risk of insufficient air renewal (41% of the farms). Housing design was considered at risk for draughts on calves in 21% of the farms and was associated with lower morbidity.
Specific medical prevention was not frequently used (cow vaccination in 13% of the farms, calf vaccination or systematic antibiotics to calves in 11% of the farms) and was not related to morbidity. Cows were treated against liver fluke and were administered vitamins during the dry period in respectively 10% and 35% of the farms, and vitamins were given to newborn calves in 25% of the farms. These actions were not associated with morbidity except that morbidity was higher in farms supplying vitamins to cows. Morbidity was higher in farms where navels were sometimes disinfected (13% of the farms), but lower where navels were never disinfected (42% of the farms) compared to farms where navel disinfection was systematic.
Farms with more than 35% primiparous cows experienced higher morbidity. Other herd characteristics were not related to morbidity.

Table II
Quantification of the effects of risk factors increasing significantly calves morbidity between 24 h and 15 days

Variable	% farms	RR	PAF (in %)	p
Colostrum feeding (ref: provides regularly early intake)				
provides sometimes early intake	26.3	1.20	30.4	0.02
not aimed at early intake	39.0	2.51		
No 1st-milking colostrum if dam milked before calving (ref: some)	18.2	1.72	9.2	0.04
Use of mastitic milk for calves feeding (ref: no)				
only for bull calves or older calves	54.9	1.83	36.1	0.07
for all calves	15.3	1.78		
Water supply (ref: drinkable water)				
no water supply	14.0	2.28	14.7	0.01
non drinkable water	7.2	1.87		
Housing in the first month (ref: individual)				
group pens after 1 week with age difference < 3 weeks	15.7	1.21	24.6	0.01
group pens after 1 week with age difference >=3 weeks	21.2	2.07		
group pens at birth with age difference < 3 weeks	11.0	0.74		
group pens at birth with age difference >= 3 weeks	16.5	2.38		
Contact with older cattle (ref: no)	31.4	1.49	10.8	0.09
Introduction of calves from other farms (ref: no)				
seldom	20.8	1.52	11.4	0.18
regularly	7.6	1.56		
Sick calves not isolated from healthy calves (ref: isolated)	71.1	2.00	39.0	0.01

RR: relative risk, PAF: population attributable fraction, p: significance level in the final logistic regression model

DISCUSSION AND CONCLUSIONS

Mortality and morbidity rates in this study were slightly higher than previously described by Vallet (1996) in French farms. Some farms experienced high morbidity and mortality rates in calves whereas in others health disorders in calves were very seldom. Average herd size and milk yield per cow of the farms included in this study were higher than the average of dairy farms in France but just above the average of dairy farms enrolled in

the Milk Recording Scheme in West of France. Criteria that were accounted for to choose the 40% of the farms conveniently selected are assumed not to be linked to calf health or management. Results of this survey can therefore be generalized to dairy farms of West of France:

Risk factors significantly associated with higher morbidity have been described for many years, but their effects in current farming conditions are still important. Quantification of these effects provides information to focus on factors with the strongest effects. On the one hand, to improve calf health in a given farm, modifications of newborn calf management practices should focus on the risk factors present in the farm which have the highest relative risks. On the other hand, to develop control programmes, extension services should set priority on risk factors which have the highest population attributable fractions.

Factors with a high population attributable fraction have both a strong effect and a high prevalence. Population attributable fraction is an estimate of the proportion of cases (defined as herds with morbidity over 20%) that could be prevented if all the farms in the population were at the reference level for the considered risk factor and if other risk factors were at the same levels (Bruzzi et al., 1985, Martin et al., 1987). Interpretation of the population attributable fraction relies on the assumption of a causal effect of the risk factor. Some of the relative risks calculated in this study suggest that they measure relationships that are not causal but rather express adaptations of management consecutive to disease occurrence. An example is given by higher morbidity in farms where vitamins are administered to cows during the dry period. In such cases, the assumption of causal relationship cannot be made. Estimation of population attributable fraction for such reversed relationships was therefore not deemed relevant.

Some of the risk factors present in the farms or some control actions were not related to morbidity. Absence of statistical relationship can result from absence of effect of these factors in current field conditions, or from insufficient sample size, or from the fact that assessment of some factors is difficult. The latter reason can be suspected about absence of effect of poor hygiene as a farm visit is not sufficient to measure actual hygiene level accurately. Nevertheless, factors for which an effect was evidenced should be considered in priority.

For better calf health, in current dairy farming, management of newborn calves can still be much improved regarding early intake of colostrum, good quality of milk and water fed to calves, prevention of cross-contamination between calves of different ages, of different origins, from diseased calves, and from older cattle. Some of these management practices appear to be easily and economically modifiable (colostrum feeding, separation of diseased calves), whereas for others costs for changes can be high (housing design).

Anyway, reasons why risk factors known for long are still frequently present in dairy farms should be further investigated. Reasons which may be assumed are: farmers' knowledge on the existence or the effect of risk factors is insufficient, farmers are not aware of the economic consequences of calf diseases in their herd, changes in management practices require labour time or money which are not available.

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