Survey of preweaning dairy calf-rearing practices in Czech dairy herds

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ABSTRACT

It is important to describe weaknesses in rearing calves not only to improve their welfare, but also to detect areas where current scientific knowledge is poorly integrated into practice. A survey of preweaning calf-rearing practices was conducted using a farmer questionnaire. The survey included 136 farms, representing 11.9% of all dairy cows in the Czech Republic. Mean herd size ($\pm$ standard deviation) was 326 ± 131.4 cows, and mean milk production $7,413 \pm 1,389.5$ kg per cow per year. We evaluated 59 farms with Holsteins (H) and 77 with the Czech Fleckvieh breed (C). The survey revealed that (1) calving in group pens predominated (67.6% of farms); (2) no disinfection of calf navels occurred on 11.8% of herds; (3) pooled colostrum was fed on 15.4% of farms; (4) colostrum quality was controlled on only 44.1% of farms, and only 73.5% of farms had reserve colostrum stocks; (5) nonmarket waste milk was fed in 64.7% of herds but it was pasteurized in only in 6.8% of herds and acidified in 35.2% of herds; (6) milk replacer was mixed with nonmarket waste milk on 52.9% of farms; (7) 58.8% of farms enabled calves to obtain milk by sucking and 41.2% by drinking from a bucket; (8) the main criterion in weaning was calf age (61.7%), followed by acceptance of starter and concentrated feed (19.9%) and lack of housing capacity (18.4%); and (9) newborn calves were individually housed on 96.7% of farms and group-housed on 3.3% of farms. The most marked differences in calf-rearing management between Holstein and Czech Fleckvieh farms were (1) a higher proportion of operations calving in tie-stalls or stanchions in C (6.5%) versus H (1.7%) farms; (2) a higher proportion of untreated navels on C (15.6%) versus H (6.8%) farms; (3) a lower proportion of C (11.7%) versus H (20.4%) farms feeding pooled colostrum; (4) a lower proportion of C (39%) versus H (50.9%) farms monitoring colostrum quality; (5) sucking milk from nipple buckets predominated (61%) on C

farms, whereas drinking from an open bucket was most common (64.4%) on H farms; (6) age was the main criterion in weaning calves of both breeds (C farms: 55.8%, H farms: 69.5%), whereas the second most important criterion was lack of housing capacity (28.6% of farms) on C farms and the amount of consumed starter (25.4%) on H farms. We observed a difference in duration of colostrum period between C herds (median 5 d) and H herds (median 4 d). A tendency was observed for age of calves at weaning (C herds: median at 9.1 wk, H herds: median at 10 wk).

Key words: calf, rearing, farm management, welfare

INTRODUCTION

The health of newborn and older calves is a result of balancing immune defenses, physical and metabolic stresses, nutrition, and environment (Heinrichs, 1993), and calf health affects the economics of a dairy operation (Campbell et al., 2007). Whether calves from the dairy herd are being reared as dairy herd replacements or for beef production, a good start in life is essential (Allen, 2004).

The key features of successful newborn dairy calf management are ensuring proper calving management, strategic navel antisepsis, prompt movement of the newborn calf to hygienic calf housing (Mee, 2008), and efficient colostrum management (McGuirk and Collins, 2004; Godden, 2008). In the weaning period, the amounts and management of milk feeding have immense effects on calf performance, behavior, health, and welfare (Heinrichs et al., 1995; Khan et al., 2007a). The decisive criterion determining a calf's preparedness for weaning should be its current consumption of solid feed (EFSA, 2006). The main purpose in individually housing calves is to minimize the spread of diseases and facilitate control over the animals' acceptance of starter (Bach et al., 2010), but good results have also been achieved among calves housed in pairs, which allows them greater space for movement and social opportunities without negative influence on health and growth (Chua et al., 2002).

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Table 1. Characteristics of 136 dairy farms surveyed compared with all farms in the Czech Republic

Item	Czech Republic	Sample	Holsteins	Czech Fleckvieh
Dairy farms, no.	1,296	136	59	77
Cows, no.	373,705	44,331	20,546	23,875
Mean herd size, no. of cows	273 ¹	326 ± 131.4	348.2 ± 134.8	308.9 ± 127
Mean (± SD) milk production, kg/cow per year	7,128 ¹	7,413 ± 1,389.5	8,495.4 ± 1,257.8	6,585.3 ± 786.5

¹Data from the Czech-Moravian Breeders' Corporation (Kvapilík et al., 2012).

Due to the changes in modern farming, calf-rearing methods differ in individual countries and according to breed (EFSA, 2006); therefore, results from one country are not necessarily relevant for dairy farms in other countries (Svensson et al., 2006). In the United States, calf-rearing management practices differ not only between eastern and western states but also among herds of different sizes (USDA-APHIS, 2012). Vasseur et al. (2012) reported differences in dairy calf management practices between Central Europe States and Canada (Quebec); these were related to calving management and care of the newborn, colostrum management, calf-dam separation, calf feeding, weaning, and calf housing. The first step in a strategy to improve animal welfare at the level of agricultural enterprises is to identify the main risks to animal welfare within a designated sampling of farms (Whay, 2007) or to describe those management methods in use that can most endanger animal welfare (Vasseur et al., 2010).

The goal of this study was to make the first extensive investigation in the Czech Republic to show strategies in farm management at calves from birth to weaning and to obtain relevant information about risk factors in this period of calf rearing. The results were analyzed for all investigated farms as well as separately for farms with Holstein and Fleckvieh breeds to define similarities and differences between those 2 breeds.

MATERIALS AND METHODS

Description and Characteristics of Czech Climate and Dairy Herds

The Czech Republic is situated in moderate temperature zone with evenly proportioned amount of rain during the year. According to Köppen's climate classification, the Czech Republic is classified as cfb (most of the country) and dfb (highlands; Tolasz et al., 2007). In the Czech Republic, the number of cows housed in tiestalls decreased from 77.5% of cows in 2000 to 11% of cows in 2010. In 2000, the average operation in the Czech Republic had 194 cows and 114 in stalls; in 2012, the average operation had 281 cows and 238 cows in stalls (Kvapilík et al., 2001, 2013).

Selection and Description of Herds

One hundred thirty-six farms were chosen for the survey, comprising the 2 main dairy cattle breeds in the Czech Republic: Holstein (**H**), a milk breed, and Czech Fleckvieh (**C**), a dual-purpose breed. Together, these breeds account for 93% of the Czech dairy cow population. Farms with 100 to 600 cows were selected for the evaluation (54.3% of operations in the Czech Republic have 100 to 500 cows). All evaluated farms were enrolled in production testing. Table 1 presents an overview of production data for the selected farms and for Czech farms as a whole.

Data Collection and Description

Data were collected from the 136 farms during 2012. The survey was conducted at breeding seminars focused on translating research findings into practice, with a dedicated time of 90 min set aside for farmers to provide the information using standardized questionnaires. Considering the great interest in these events and the absence of some herd managers, a few questionnaires were sent to these active participants electronically to be completed later. Ambiguities were generally resolved with the breeders immediately, and a few questionnaires were resolved by telephone or at a personal meeting with the farm manager. The topics included in the questionnaire were selected based upon reports of the United States National Animal Health Monitoring System (NAHMS) Dairy Heifer Raising, 2011 report (USDA-APHIS, 2012), NAHMS Dairy 2007 report (USDA-APHIS, 2010a,b), and the Czech Republic's national regulations Decree No. 2008/2004 Coll. on Minimum Standards for the Protection of Farm Animals, Decree No. 136/2004 Coll. on Details of Marking Animals and Their Registration and Registering of Farms and Entities as Defined by the Breeding Act (Czech Republic, 2004a,b). The questionnaire was divided into 7 groups of calf management practices (Table 2). Because some farmers may not want to admit their mistakes, some of the results reported herein, which are based on farmers' answers, may bear a farmer's bias and thus may not completely reflect

Table 2. Studied parameters of calving and preweaning calf management

Area of management	Criterion (variable)
Calving management and care of the newborn	Period of housing the cow in a maternity pen before calving, calving area, use of a maternity pen, type of maternity pen, separating the calf from the mother, number of navel treatments with disinfectant (type and method)
Colostrum management	Time of the first colostrum meal, colostrum origin, method, quantity, number and duration of colostrum period, evaluation of colostrum quality, stocks of colostrum
Calf feeding	Milk: type, use of pasteurization or acidification, use of waste milk Milk feeding plan: quantity, number of meals, method of distribution, adjusting diet (winter) Concentrate, hay, ensiled feed and water: age at access
Calf housing	Individual housing: period, type, indoors and outdoors, materials, floor and bedding Group housing
Weaning	Criteria, type, and age
Dehorning	Method, age, dehorning personnel
Calf management activities	Time of marking calves Weighing after birth and at weaning

reality on the farms. Our comparison of several sample questions, however, indicates that most of the answers were in general agreement with reality.

Statistical Analyses

The acquired questionnaires were inspected upon collection. While compiling the database, all information was examined so that recording errors could be rectified with the relevant farm manager. Statistical analysis of qualitative questions was performed using descriptive statistics expressed in percentage terms. The normality of quantitative traits was verified by the Shapiro-Wilk test. The normality of testing date was not confirmed; therefore, the Mann-Whitney U-test was used to evaluate differences in quantitative traits between the 2 breeds in the present study by using Statistica 10 software (2011; Statsoft Inc., Tulsa, OK).

RESULTS AND DISCUSSION

Calving, Calf-Dam Separation, and Calf Care

The calving area was a part of the housing area for lactating dairy cows on 44.9% of all farms (48.1% of C farms, and 40.7% of H farms), which can negatively influence milk production during natural photoperiod or long-day photoperiod during subsequent lactation (Dahl, 2008).

Risk of respiratory diseases is lower in calves born to cows in individual maternity pens than in those born in group pens (Svensson et al., 2003). Individual maternity pens were used on 28% of all surveyed farms, (30.5% of H farms and 26% of C farms), and group maternity pens were used on 67.6% (Table 3). Cows and heifers were moved into the maternity pen 14.5 d (median) before calving, with 50% of farmers housing cows in the maternity pen for ≥ 14 d before expected

birth (group maternity pens: 19 d; individual maternity pens: 4 d before anticipated calving). The maternity pen should be used only for the calving itself, not as an area for housing dry cows or those in the transitional period.

In most of the surveyed Czech operations, early separation of calves from cows (median 4 h) was a recommended strategy to eliminate the risk for failure of passive immunity transfer in calves (McGuirk and Collins, 2004; Trotz-Williams et al., 2008). A slightly higher proportion of calves were separated from their mothers before 12 h in C herds (89.6%) compared with H herds (84.8%). Across all surveyed farms (Table 3), 88.2% of calves had their navels treated, the preferred methods being dipping (39.7%) and spraying (35.3%). Calves' navels were treated only once in 66.9% of herds (64.9% of C farms, 69.5% of H farms), despite the fact that repeated navel treatment is efficient prevention against navel inflammation (EFSA, 2012).

Colostrum Feeding

Proper management of colostrum feeding in calves is essential for their survival, health, and future productivity (e.g., McGuirk and Collins, 2004; Godden, 2008). In 66.9% of surveyed operations (Table 4), calves were fed colostrum from their own dams (76.6% of C operations, 54.2% of H operations); in 15.4%, calves were fed pooled colostrum. Across all operations, the median time of administering the first colostrum was 2 h. Most operations (90.5%) evaluated here administered first colostrum to calves within the first 6 h after birth (maximum time allowed in the Czech Republic). A significant difference ($P = 0.001$) was detected in the duration of the colostrum feeding period in C (median 5 d) and H operations (median 4 d).

The total amount of colostrum administered to calves from birth to 24 h was 5 L (all farms) and was provided

Table 3. Survey responses regarding calving management and calf care in medium-large dairy herds (100 to 600 cows) in the Czech Republic

Survey answer	Category	All herds		Czech Fleckvieh		Holstein	
		No.	%	No.	%	No.	%
Calving pen							
Use of calving pen	Individual	38	28	20	26	18	30.5
	Group	92	67.6	52	67.5	40	67.8
	Tie stalls	6	4.4	5	6.5	1	1.7
Calf care							
Regarding method of navel treatment	Dipping	54	39.7	25	32.5	29	49.2
	Spray	48	35.3	28	36.3	20	33.8
	Drenching	18	13.2	12	15.6	6	10.2
	No treatment	16	11.8	12	15.6	4	6.8

to calves twice on 47.8% of farms and 3 times on 41.2% of farms. A bottle with teat was used for feed colostrum in 77.1% of surveyed farms, whereas 10.3% used an open bucket; other methods of colostrum feeding are presented in Table 4. Half of the investigated farmers

described using an esophageal tube for calves with low vitality (e.g., after dystocia).

In our survey, only 44.1% of farmers evaluated the quality of colostrum (39% of C farms, 50.9% of H farms). All of those farmers used a colostrometer; opti-

Table 4. Survey responses regarding colostrum management and milk nutrition in medium-large dairy herds (100 to 600 cows) in the Czech Republic

Survey item	Category	All herds		Czech Fleckvieh		Holstein	
		No.	%	No.	%	No.	%
Colostrum management							
Colostrum from primiparous cows	Not fed	11	8.1	6	7.8	5	8.5
	Sometimes	63	46.3	34	44.2	29	49.2
	Always	62	45.6	37	48	25	42.3
Origin of colostrum	From the dam	91	66.9	59	76.6	32	54.2
	Another specific cow	24	17.7	9	11.7	15	25.4
	Pooled colostrum	21	15.4	9	11.7	12	20.4
Method of colostrum feeding	3-L zinc bottle with nipple	72	52.9	48	62.3	24	40.7
	Plastic bottles with nipple	33	24.2	17	22.1	16	27.1
	Open bucket	14	10.3	4	5.2	10	16.9
	Bucket with nipple	12	8.8	7	9.1	5	8.5
	Esophageal tube	5	3.7	1	1.3	4	6.8
Using esophageal tube for calves with low vitality	Yes	68	50	39	50.6	29	49.2
	No	68	50	38	49.4	30	50.8
Colostrum quality control	Yes	60	44.1	30	39	30	50.9
	No	76	55.9	47	61	29	49.1
Stocks of colostrum	Yes	100	73.5	56	72.7	44	74.6
	No	36	26.5	21	27.3	15	25.4
Milk nutrition							
Type of liquid milk diet	Milk replacer	48	35.3	28	36.4	20	33.9
	Pooled colostrum	8	5.9	2	2.6	6	10.2
	Pooled colostrum with milk replacer	34	25	22	28.6	12	20.3
	Waste milk	8	5.9	3	3.8	5	8.5
	Waste milk with milk replacer	38	27.9	22	28.6	16	27.1
Pasteurization of milk	Yes	6	6.8	4	8.2	2	5.1
	No	82	93.2	45	91.8	37	94.9
Acidification of milk	Yes	31	35.2	17	34.7	14	35.9
	No	57	64.8	32	65.3	25	64.1
Feeding method	Automatic feeding system	3	2.2	2	2.6	1	1.7
	Nipple on a fixed platform	9	6.6	8	10.4	1	1.7
	Open bucket	56	41.2	18	23.4	38	64.4
	Nipple bucket	64	47.1	47	61	17	28.8
	Nipple bottle	4	2.9	2	2.6	2	3.4
Adjusting of milk liquid diet in winter	Yes	88	64.7	48	62.3	40	67.8
	No	48	35.3	29	37.7	19	32.2

cal and digital refractometers were not used on any operation, despite their practical advantages and research findings showing that they work well in estimating IgG content in the first bovine colostrum (e.g., Biemann et al., 2010; Quigley et al., 2013). Colostrum stocks are necessary when a cow cannot be milked for health reasons (such as milk fever), dies, or when the colostrum is found by evaluation to be of low quality (low IgG content) or adulterated (mastitis, blood). In total, 73.5% of all breeders had frozen stocks of colostrum (Table 4). Insufficient stocks of colostrum indicate insufficient knowledge as to the importance of timely feeding of calves with colostrum.

Marking and Weighing Calves

Calves in the Czech Republic must be marked with permanent ear tags no later than 20 d after birth, and an unmarked calf must not leave the farm where it

was born (Decree No. 136/2004 Coll.; Czech Republic, 2004a). The median age for marking calves was 2 d. Across all evaluated operations, calves were weighed in just 2.2% of herds (Table 5), and 35.3% of all operations weighed calves at weaning or before moving them to other facilities.

Disbudding

According to ALCASDE (2009), 81.5% of dairy cattle in countries of the European Union are dehorned (82% in free housing and 52% in tie stalls or stanchions). In the Czech dairy herds surveyed, calves were disbudded in 96.3% of all operations at a median age of 4.3 wk (Table 6). Cauterizing by hot iron was the most-used method (77.9% of all herds) of disbudding calves. In the Czech Republic, calves may be dehorned up to 4 wk of age without using analgesia or anesthesia by both veterinarians and veterinary technicians (gradu-

Table 5. Survey responses regarding parameters of housing, weaning strategies, weighing, and dehorning of calves in medium-large dairy herds (100 to 600 cows) in the Czech Republic

Survey item	Category	All herds		Czech Fleckvieh		Holstein	
		No.	%	No.	%	No.	%
Housing							
Housing of calves after birth	Individual pens	34	22.4	21	23.9	13	20.3
	Individual hutches	113	74.3	64	72.7	49	76.6
	Group hutches	5	3.3	3	3.4	2	3.1
Housing technology used	Open space	83	54.6	47	53.4	36	56.3
	Shelter at the barn	28	18.4	17	19.2	11	17.2
	Shelter not at the barn	25	16.4	10	11.4	15	23.4
	Calf barns	9	5.9	7	8	2	3.1
	Dairy cow barns	7	4.7	7	8	—	—
Materials of housing construction	Wood	44	29	23	26.2	21	32.8
	Plastic	93	61.2	56	63.6	37	57.8
	Metal	7	4.6	6	6.8	1	1.6
	Metal construction and fabric	8	5.2	3	3.4	5	7.8
Weaning period							
Weaning criteria	Amount of starter	27	19.9	12	15.6	15	25.4
	Age of calves	84	61.7	43	55.8	41	69.5
	Housing capacity	25	18.4	22	28.6	3	5.1
Weaning method	Gradual weaning	91	66.9	53	68.8	38	64.4
	Abruptly weaning	45	33.1	24	31.2	21	35.6
Weighing of calves							
Weighing after birth	Yes	3	2.2	1	1.3	2	3.4
	No	133	97.8	76	98.7	57	96.6
Weighing after weaning	Yes	48	35.3	30	39	18	30.5
	No	88	64.7	47	61	41	69.5
Dehorning of calves							
Dehorning	Yes	131	96.3	73	94.8	58	98.3
	No	5	3.7	4	5.2	1	1.7
Dehorning personnel	Farm managers	93	71	54	74	39	67.3
	Farm personal	28	21.4	17	23.2	11	19
	Veterinary	7	5.3	1	1.4	6	10.3
	Veterinary technicians	3	2.3	1	1.4	2	3.4
Methods of disbudding	Electric cauterizing irons	63	48.1	35	48	28	48.3
	Gas-fired cauterizing irons	39	29.8	20	27.4	19	32.8
	Chemical methods	26	19.8	16	21.9	10	17.2
	Mechanical methods	3	2.3	2	2.7	1	1.7

ates of veterinary secondary schools). At over 4 wk of age, calves may be dehorned only by veterinarians using analgesia or anesthesia. The proportion done by veterinary technicians and veterinarians was only 7.6% in all operations surveyed. The proportion of farms on which veterinarians and veterinary technicians did this work was higher in H operations (13.7%) than in C operations (2.8%).

Calf Feeding

Calves were fed milk replacer on 35.3% of all farms, fed waste milk blended with milk replacer on 27.9% of farms, and fed pooled colostrum blended with milk replacer on 25% of farms (Table 4). Problems with feeding a farm's nonmarket waste milk can include not only its inconsistent quality but also high level of microbial contamination (Moore et al., 2009). Bacterial contamination of nonmarket waste milk can be reduced by pasteurization (Elizondo-Salazar et al., 2010) or acidification. Of 88 farms (from the total of 136 farms surveyed) feeding waste milk, only 6.8% pasteurized the milk, whereas 35.2% of farms acidified it, most frequently with formic acid. Calves were not fed marketable milk on any of the farms evaluated. The milk feeding plan used in the surveyed herds was a median of 6 L of milk or milk replacer per day given in 2 meals during the first week, 6 L in 2 meals between the first and the last week before weaning, and 5.7 L in 2 meals during the last week of the milk feeding period. On 58.8% of all farms, calves were allowed to feed on milk or replacer by sucking, whereas on 41.2% of farms, calves drank from an open bucket (Table 4). On C farms, feeding of calves with nipple buckets predominated (61% of operations), whereas on H farms, drinking from buckets was predominant (64.4% of operations). Bucket-fed calves are unable to perform their natural sucking behavior, whereas teat-based milk feeding systems provide such an opportunity (Vasseur et al., 2010). Nursing cows were not used on any farms in our survey. Farm management strategies to eliminate the negative influence of cold stress on the growth and health of calves in winter and early spring include more intensive feeding and increasing the intake of energy in the diet (Nonnecke et al., 2009). Out of 88 farms where the milk diet was adjusted in winter, 64.3% increased the volume of daily milk or milk replacer (C farms 70.8%, H farms 50%), 28.4% of farms included one extra feeding, and 53.4% of farms increased the concentration of the milk replacer.

A smooth transition from milk feeding to consumption of solid feed (forages and grains) allows the transition from simple stomach digestion to functioning digestion

within the rumen; this is crucial for successful calf-rearing, especially in regard to calf health and growth (Khan et al., 2007b, 2011). Calves on 97.1% of all farms surveyed had access to starter feed or concentrated feeds at a median age of 5 d after birth. Hay was provided by 94.1% of all farms after 56 d of age (C farms: 50 d, H farms: 60 d; $P = 0.32$). Ensiled feed (corn and hay silage or TMR) was provided to unweaned calves before weaning on 58.8% of all farms and starting at a median 68 d of age (C farms: 63 d, H farms: 70 d; $P = 0.71$); that is, very close to weaning or soon after weaning. On 81.3% of farms where calves were fed ensiled feed before weaning, calves were housed in groups (C farms: 76.2%, H farms: 86.8%). Management of calf feeding should also include *ad libitum* intake of water to maximize the intake of starter and growth, especially when calves are fed restrictive milk diet (Kertz et al., 1984). Water was provided to calves on all 136 farms during the milk feeding period (Table 6), starting at 3 d of age.

Weaning

Dairy calves should be weaned in accordance with their current consumption of dry feed, not just on the basis of their age or weight (EFSA, 2006). Age was the decisive criterion for weaning on 61.7% of farms, amount of starter was the decisive criterion on 19.9% of farms, and an insufficiency of free housing capacity for preweaning calves was the decisive criterion on 18.4% of all surveyed farms (Table 5). On C farms, the second most common criterion was lack of housing capacity (28.6%).

Intake of starter and incremental growth are greater in calves weaned gradually compared with calves weaned abruptly (Sweeney et al., 2010). Gradual weaning of calves was more common (66.9%) than abrupt weaning (Table 5) in our survey. In gradually weaned calves, the predominant method was to decrease the daily volume of milk or replacer, as reported by 62.6% of all farms (C farms: 66%, H farms: 57.9%). Another method practiced on the remaining 37.4% of surveyed farms (C farms: 34%, H farms: 42.1%) was a decrease in daily volume fed and concurrent decrease in the number of daily feedings. The median age of calves at weaning was 9.3 wk across all farms, and a tendency ($P = 0.09$) was observed between age of calves at weaning on C (9.1 wk) and H (10 wk) operations.

Housing

Group housing of calves is beneficial in regard to its effects on social behavior, whereas individual housing is preferred from the perspective of infections and diseases.

Table 6. Quantitative parameters of the survey in calf rearing in the Czech Republic in medium-large dairy herds (100 to 600 cows) in the Czech Republic

Survey item	All herds			Czech Fleckvieh			Holstein			<i>P</i> -value ¹
	No.	Median	MAD ²	No.	Median	MAD	No.	Median	MAD	
Calving pen										
Moving of cows in maternity pens before calving, d	136	14.5	9.64	77	14	10.37	59	15	8.89	0.89
Calf separation										
Time of separation calves from own dam, h	136	4	4.48	77	5	4.44	59	4	4.44	0.42
Colostrum management										
First colostrum meal, h	136	2	1.48	77	2	0	59	2	1.48	0.92
Colostrum quantity during 0–6 h, L	136	2.25	0.37	77	2	0.74	59	2.5	0.74	0.66
Colostrum quantity during 6–24 h, L	136	2.5	0.74	77	2.5	0.74	59	3	1.48	0.19
Total colostrum quantity during 0–24 h, L	136	5	1.48	77	5	1.48	59	5	1.48	0.41
Colostrum meals during 0–24 h, no.	136	3	1.48	77	3	1.48	59	2	0	0.57
Duration of colostrum feeding, d	136	5	1.48	77	5	1.48	59	4	1.48	0.001**
Navel disinfection										
Number of treatments of navel, no.	120	1	0	65	1	0	55	1	0	0.38
Dehorning										
Age at dehorning, wk	131	4.3	3.41	73	4.3	3.41	58	4.3	3.41	0.74
Nutrition										
Quantity of milk/milk substitute per day during first week, L	136	6	1.48	77	6	1.48	59	6	1.48	0.71
Quantity of milk/milk substitute per day between first and last week, L	136	6	1.48	77	6	1.48	59	6	1.48	0.84
Quantity of milk/milk substitute per day during last week, L	136	5.7	2.52	77	5	1.48	59	6	2.96	0.55
Total volume of liquid milk diet per calf, L	136	399	118.61	77	399	117.12	59	394	120.10	0.51
Age at milk replacer feeding, d	120	6	1.48	72	6	1.48	48	6	1.48	0.19
Age at concentrate access, d	133	5	2.96	76	5	2.96	57	4	1.48	0.21
Age at hay access, d	128	56	20.77	75	50	29.65	53	60	14.82	0.32
Age at silage feed access, d	136	68	17.79	77	63	19.27	59	70	14.82	0.71
Age at water access, d	136	3	2.96	77	4	2.96	59	3	2.96	0.51
Grouping of calves										
Grouping of calves, wk	136	8.1	2.08	77	8	1.48	59	8.6	2.22	0.17
Weaning										
Age at weaning, wk	136	9.3	1.78	77	9.1	1.48	59	10	2.07	0.09*

¹Mann-Whitney U-test (Wilcoxon rank sum test with continuity correction).²MAD = median absolute deviation.***P* < 0.01; **P* < 0.1 (tendency).

es. In the Czech Republic, no calf may be confined to an individual pen after the age of 8 wk (except isolation pens for sick calves). Calves were housed individually on 96.7% of Czech farms for a median of 8.1 wk (Table 5); calves in H operations were shifted into groups (8.6 wk) slightly later than calves in C operations (8 wk), although this difference was not significant ($P = 0.17$). Most calves (74.3% of all farms) were housed in individual hutches. The most widespread materials for individual housing of calves were plastic (61.2%) and wood (29%), with plastic being easier to clean and disinfect than wood (Table 5). The calves were moved into groups before weaning on 68.4% of farms (C farms: 68.8%, H farms: 67.8%). Tied housing was not used on any of the farms. Calves were housed outdoors on 54.6% of all operations, in shelters at the barn in 18.4%, in shelters not at the barn in 16.4%, in calf barns in 5.9%, and in dairy cow barns in 4.7%. No H calves were housed in milk cow barns, whereas 8% of C calves were housed in dairy cow barns. A higher proportion of calves in H operations were housed in shelters not at the barn (23.4%), whereas just 11.4% of C operations housed calves in shelters not at the barn.

Hutches and pens for calves were placed on reinforced surfaces (concrete floor, panel platforms, or asphalt-concrete areas) on 80.9% of farms and were placed on soil on 19.1% of farms. Long wheat straw has traditionally been used as bedding for rearing calves (Panivivat et al., 2004) and was used exclusively on all farms. Bedding was not replaced during the rearing period in 94.5% of operations, although additional straw was regularly added for the calves.

CONCLUSIONS

The objective of this survey was to identify weak areas of dairy calf-rearing during the milk nutrition period in dairy herds, doing so for operations generally and also according to the individual breeds raised (Czech Fleckvieh and Holstein). Management of the Czech Fleckvieh breed was found to differ from the Holstein operations only in the duration of the colostrum feeding period and we observed a tendency for length of milk feeding to differ between the 2 breeds (9.1 wk for C and 10 wk for H). No other statistically significant differences were found between C and H operations. Research into calf-rearing during the preweaning period is one of the key elements for determining points of risk and identifying weaknesses and strengths in the area of feeding and management practices on dairy farms. Descriptions of weaknesses in calf-rearing practices provide opportunities for applying existing scientific and research findings in daily practice.

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