

HOUSING CONDITIONS IN CALVES WELFARE RISK ASSESSMENT

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Abstract: This paper shows results of calf welfare risk assessment at intensive breeding farms. Assessment has been conducted on the basis of housing conditions which can have negative influence on welfare of cattle, especially in calf category considering their needs. According to analysis results very good housing conditions were confirmed in open shed rearing stall (C) and closed type rearing stall without feeding yard (A), whilst in closed rearing stall with feeding yard (B) housing conditions were estimated as acceptable. Based on collected data about housing conditions, we have estimated that the least risk for calf welfare is at C farm, slightly higher at A farm and the highest at B farm. Data about housing conditions and analysis of potential welfare risk factors show possible causes for already present health and other problems with animals, which also can reappear in future. However for that reason, applying described methods can increase rearing conditions and increase production at cattle farms.

Key words: housing conditions, risk assessment, welfare, calves.

Introduction

Successful milk production is based on proper calf rearing, especially the youngest categories. Rearing conditions need to satisfy the basic life needs of calves, which are described in Broom (1991, 1996) publications. Moreover, calves need proper air quality and enough moving, resting, playing space, and space for expressing their inquisitive and social nature, proper diet and enough drinking water. If their life needs are not fully met, the cattle welfare question arises. Consequences of insufficient welfare can include changes in behaviour and health condition of calves, from appearance of stereotypes, to the worst consequence, death of calves.

Calf welfare as well as welfare of other farm animals can be estimated in a couple of ways. In Austria, during second half of the last decade of 20th century evaluation system of basic calf needs has been developed, ANI 35/L 1996 which has

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been used by scientists and experts from different countries in their research, such as Czyszter et al. (2009) in Romania. In Canada they have used welfare factor analysis of calves and heifers of high yielding milk breeds, described in paper by Vasseur et al. (2009). Detailed welfare assessment system based on number of factors which are measurable is given in publication which is result of European welfare quality project (Welfare Quality[®], 2009).

A significant contribution to the research of calf welfare was the report from Scientific veterinarian welfare committee in the year of 1995 (SVC, 1995), which contains information on ways of measuring the level of welfare, needs of calves, descriptions of calf accommodation systems and animal feeds, as well as other elements important for rearing calves. This report represents the base for publications of European Food Safety Authority (EFSA, 2006a, b), in which another approach of studying the levels of welfare, assessment of welfare risk in conditions of intensive calf rearing has been described.

The principle of conducting the assessment of welfare is similar to the principle of assessment of microbiological food safety risks and it is based on instructions of Codex Alimentarius Commission (CAC, 2002). According to that, the assessment of risk is conducted in several phases: identification of hazards, establishing the character of hazard, estimation of population exposure and evaluation of risks. Any factor which can have a negative effect on calves represents a hazard, and the risk connected to the possibility of expression of that factor and its negative influence intensity is connected to welfare of calves. By getting to know the risks character at one farm, it is possible to find ways to remove those factors or lessen their harmful effects.

Depending on certain effects on calf health, taking one factor in certain breeding conditions, it can be more or less significant, so those risks are systematised in 'major' and less significant – 'minor' groups. In defining the risks, a multidisciplinary approach has been used by experts with years of experience in different areas: animal husbandry, etiology, veterinarian medicine, risk estimations and food safety (EFSA, 2006a).

Main risks in calf welfare when we look at the housing conditions are: inadequate ventilation (amount of fresh air), speed of air inflow and air temperature in certain breeding systems, as well as exposure to specific pathogens which cause respiratory and gastrointestinal infections. In some breeding systems mentioned factors can represent minor risk as well as draft, high humidity and bad air quality in stall. Also minor risks include the bad flooring characteristics, inadequate light conditions and inadequate spatial conditions.

Except the housing conditions for full picture about welfare we need to take into consideration diet and certain management techniques (group forming, ways of ending the weaning period, attitude of breeders towards animals). Considering the significance of ambient conditions and its effect on health and behaviour of cattle, researched by Wilson et al. (1999), Reinhold and Elmer (2002), Xiccato et al. (2002), Howard

(2003), and numerous other authors, the main goal of this paper is the assessment of welfare risks considering the housing conditions in stalls of different characteristics.

Materials and Methods

In this paper the housing conditions for Holstein-Frisian calves at the farm with intensive rearing system are analysed. Younger calf categories were housed in group boxes in enclosed type stalls: without the usage of feeding yard and with automatic milk feeders (facility A), and with the usage of feeding yard and without automatic milk feeders (facility B). Older calf categories were held in open type stalls with eaves (facility C). Group size in enclosed stalls is between 11 and 17 animals per box, and in open type 20-50 animals.

Data about spatial, microclimatic and hygiene conditions of calf housing were collected according to the descriptions given in the papers by Hristov and Relić (2009) and Relić et al. (2009). Measuring of the box size was done by metre and rope tie, then air quality parameters were taken (air temperature, humidity and velocity, amount of available light) by appropriate combined instrument; presence of hazardous gasses is determined organoleptically, and the assessment of condition and hygiene of flooring and bedding was done visually. Collected data were grouped and points were given according to its compatibility with calf needs and minimal standards for rearing of this category (DEFRA, 2005; EFSA, 2006a). Each parameter was evaluated with minimum 0 and maximum of 5 points. Dividing the total number of points by number of parameters evaluated, the final housing evaluation mark is assigned (0-1,9 insufficient; 2,0-2,4 acceptable; 2,5-3,4 good; 3,5-4,4 very good; 4,5-5,0 excellent).

Estimation of welfare risk based upon housing conditions was conducted according to the method described in EFSA (2005, 2006b) publication, where the influence of specific risk factors was evaluated on the basis of numerous researches and opinions of experts.

Microclimatic conditions which can represent risk for calf welfare are: high humidity, too high or too low air temperature, draft, inadequate ventilation, insufficient air inflow, velocity and distribution of fresh air in the facility, presence of hydrogen sulphide and large amounts of ammonia, microorganisms and dust in the air, insufficient lighting in the facility.

Spatial condition risk is connected to poor flooring characteristics, insufficient resting space per head, insufficient exposure to the sun, social isolation and environment with insufficient visual, tactile and other stimuli.

Hygienic condition risk is represented by bad hygiene of bedding and environment of calves, what can contribute to the appearance of respiratory and gastrointestinal infections.

Multiplying values of the assessment of single risk factor (assessment marks from 1 to 5) by values of risk exposure, e.g. possibility and frequency of appearance at population level (marks from 1 to 5) we get the certain amount of points which identifies the particular risk. Number of possible points is between 57 and 258, and higher point values signify higher risk for the welfare. In this paper, during the assessment of individuals' exposure to the certain risk the data gathered about housing conditions were taken into the consideration.

Results and Discussion

Rating of the parameters for calves facilities are showed in Table 1. According to the data given in Table 1, housing conditions for the facility C had the highest mark (very good 3.8). Considering that it is an open facility with eaves under which is bedding, and air quality in that facility is dependent on atmospheric conditions, for that reason the mark for measured values for temperature, relative humidity and air velocity is not given. Other air parameters such as the quality of the air (draft, dust particles and hazardous gasses) got the highest mark (5) because they were not present. The mark 5 was also given for spatial conditions which calves have for resting and moving. The lowest mark 2 was given for ventilation system functioning which is completely based on natural air inflow and there are not possibilities for cooling the animals during summer nor for protecting them during winter low temperatures.

Conditions in the facility of closed type A were also assessed as very good (3.5). The lowest mark (2) was given for dust presence, and the highest mark (5) was received for spatial conditions per head and air temperature.

In the facility B which is closed type the housing conditions were assessed as good (2.53). The lowest mark (1) was given for functioning of ventilation system, presence of high humidity and also for presence of hazardous gasses, in respect to strong smell of ammonia in the air. It is considered that ammonia can be assessed organoleptically via sensory organs, if it is dissolved in the air in the concentration of 20 ppm and higher (Radenković-Damnjanović, 2004). Low grades for facility B are connected with the hygiene conditions, which are also rated as poor (2). The highest mark (4) was given for facility orientation, spatial conditions, functional state of the flooring and absence of the draft.

Data in Table 2 show quantification of welfare risk in certain facilities, where the highest risk was assessed in facility B (128 points), which is an enclosed type facility with possibility of yard usage. This result was influenced by high air humidity, inadequate ventilation, and hygiene of flooring and bedding material. High values of relative humidity increase the possibility of bacteria appearance and surviving, and their transmission among animals in the box (Lundborg et al., 2005).

In the facility A the risk is slightly lower (99 points), where welfare could be the most endangered by microclimate conditions and by exposure to causes of

respiratory and gastrointestinal diseases. According to Svensson and Liberg (2006) the frequency of respiratory diseases appearance is increased when calves are together in box in large groups, with automatic feeding system, which was the case in the inspected facility.

Table 1. Assessment of housing conditions in the facilities for calves.

Parameters	Assessment of conditions in the facility*		
	A	B	C**
Position of facility/yard connected to orientation (sun rays and dominant wind exposure)	4	4	3
Size of the box per head	5	4	5
Amount and type of bedding (bedding comfort)	3	3	4
Bedding hygiene (dryness of bedding)	4	2	4
Slipperiness of flooring	3	2	3
Functionality of flooring (presence of damages)	4	4	4
Cleanness of box flooring	3	2	3
Manure handling hygiene (frequency and ways of removing manure)	3	2	3
Hygiene of entire facility and equipment	4	2	3
Ventilation system functioning	3	1	2
Air temperature	5	3	-
Relative air humidity	3	1	-
Air velocity	4	3	-
Draft near the bedding	4	4	5
Dust particles in air	2	2	5
Hazardous gasses in air	3	1	5
Lighting intensity	3	3	4
Average*	3.5 (4)	2.5 (3)	3.8 (4)

*0-1.9 insufficient (1); 2.0-2.4 acceptable (2); 2.5-3.4 good (3); 3.5-4.4 very good (4); 4.5-5.0 excellent (5).

**assessment marks were not given for parameters in yard facility as they are dependent of outside conditions.

In the facility C the welfare risk is estimated as the lowest (70 points), and the risk is represented by hygiene of the flooring and possibility of contact with older categories which are in nearby boxes of the same facility.

If we compare data from both Tables, conditions in the facility B which are marked as the lowest are matching data from Table 2, where risk was assessed as the greatest. In addition, very good conditions which calves from the facility C have, are matching the estimated lowest welfare risk.

Based on these data risk assessment was performed for the benefit of calves in certain facilities, as shown in the Table 2.

Table 2. Risk assessment for the welfare of calves depending on the type of housing.

Risks connected to calf housing	Impact for individual*	Exposure assessment Probability/frequency of occurrence (population in facilities)**			Assessed risk in the facility			
		A	B	C	A	B	C	
High humidity	4	1	3	1	4	12	4	
Draft	3	1	1	1	3	3	3	
Inadequate ventilation (inappropriate airflow, airspeed, temperature)	5	3	4	-	15	20	-	
Poor air quality (presence of ammonia, microorganisms and dust in the air)	4	3	4	1	12	16	4	
Low insulation	2	2	1	1	4	2	2	
Poor floor conditions	Too abrasive	2	1	1	1	2	2	2
	Too slippery	4	1	2	1	4	8	4
	Too dirty	2	2	3	3	4	6	6
	Wet floor for lying	3	1	4	2	3	12	6
	No bedding	3	1	1	1	3	3	3
Dirty bedding	3	2	4	2	6	12	6	
Insufficient floor space allowance	5	1	1	1	5	5	5	
Insufficient light	5	2	1	1	10	5	5	
Lack of visual and tactile stimuli	2	2	1	1	4	2	2	
Social isolation	5	1	1	1	5	5	5	
Exposure to pathogens causing respiratory and gastrointestinal disorders	5	3	3	3	15	15	15	
Total					99	128	70	

*according to EFSA (2006a), risk influence per head: 1-slight adverse effect; 2-adverse effect; 3-moderately serious; 4-serious; 5-very serious.

**Risk exposure: 1-very rare (1-20%); 2-rare (21-40%); 3-moderately frequent (41-60%); 4-frequent (61-80%); 5-very frequent (81-100%).

In the facility A, in spite of generally very good conditions, higher welfare risk than in open-type facility C is estimated. This result was mostly influenced by the fact that calves are in the closed facility, where there is an interaction among different factors, such as: available space, interior design of box, possibility of

social interactions, characteristics of floor and bedding material, as well as microclimate. A poor quality of the air in the enclosed facilities represents one of the main factors for appearance of morbidity and mortality of calves (Svensson et al., 2003). Lundborg et al. (2005) state that bioaerosols (micro-organisms, dust), low air temperatures together with high air humidity, gases such as ammonia, draft, insufficient air space and poor ventilation form a complex environmental situation which can be detrimental, particularly for the respiratory health of young calves.

The housing systems of calves and the available space affect the development and determine which behaviours the animals are able to perform (SVC, 1995). Therefore, Stefanowska et al. (2002) concluded that calves mostly lie down near the walls, in quieter and drier parts of the box, or they stand at peripheral parts of the box, avoiding feeding area. Resting area should be dry, clean and comfortable, which is important from the aspect of time spent there, resting, quality of sleep, and maintenance of calf's body temperature. In cool or drafty floors calves spent less time resting on the side and rest curled up in order to conserve heat (Hänninen et al., 2003). According to Panivivat et al. (2004) research, wheat hay bedding has the highest temperature on surface area, comparing to other materials, but the highest number of coliform bacteria forms after one week of usage. Therefore, providing the clean and dry hay bedding, which is mostly used on our farms, is very important for lessening the risk of gastrointestinal diseases appearance. Bojkovski and Radojičić (2004), as well as Bojkovski et al. (2008, 2010) in their papers mostly describe the health problems that calves on farms in Serbia have, which are related to inadequate housing conditions.

Conclusion

Results shown in this paper indicate that calves in the open type facility (C) and enclosed facility without yard (A) have very good housing conditions, whilst in the enclosed facility with yard (B) conditions are estimated as good.

According to the performed risk analysis it is estimated that the lowest risk for calves welfare is in the facility C, slightly higher in the facility A, and the highest in the facility B.

Data about housing conditions on farm, and the analysis of potential welfare risks show a possible reason of appearance the already present health problems and other problems of calves, as well as problems which can appear in the future. For that reason, the application of the described methods can help improving the rearing conditions and production results.

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USLOVI SMEŠTAJA U PROCENI RIZIKA PO DOBROBIT TELADI

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R e z i m e

U ovom radu prikazani su rezultati procene rizika po dobrobit teladi na farmi sa intenzivnim načinom gajenja. Procena je izvršena na osnovu faktora vezanih za uslove smeštaja koji mogu da imaju negativan uticaj na dobrobit goveda u kategoriji teladi, uzimajući u obzir njihove životne potrebe. Prema rezultatima analize, vrlo dobri uslovi smeštaja teladi utvrđeni su u otvorenom objektu (C) i zatvorenom objektu bez ispusta (A), dok su u zatvorenom objektu sa ispustom (B) uslovi procenjeni kao dobri. Na osnovu dobijenih podataka o smeštajnim uslovima, procenjeno je da u objektu C postoji najmanji rizik po dobrobit teladi, nešto veći u objektu A, a najveći u objektu B. Podaci o smeštajnim uslovima i analiza potencijalnih rizika po dobrobit ukazuju na moguće uzroke već prisutnih zdravstvenih i drugih problema kod životinja, kao i na probleme koji mogu da se jave u budućnosti. Iz tog razloga, primena opisanih metoda može da doprinese poboljšanju uslova gajenja i proizvodnih rezultata na farmama goveda.

Ključne reči: uslovi smeštaja, procena rizika, dobrobit, telad.

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