

## **Respecting EU cross-compliance requirements as an indicator of animal welfare in farms with calves**

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**Abstract:** *Respecting EU cross-compliance requirements as an indicator of animal welfare in farms with calves.* The aim of the study was to estimate the level of welfare parameters in calf-rearing holdings and compare them with the cross-compliance requirements. The study was conducted in 46 farms in the winter season. The microclimate measurements, such as: moisture content, concentrations of harmful gases and the brightness of the room, has been taken in calf barns. It has been checked whether the system of calves keeping corresponds with regulations EU. The study allowed assessment of housing conditions of the calves.

*Key words:* calves, microclimate, EU requirements

### **INTRODUCTION**

Direct payments available to EU farm owners are paid subject to meeting certain standards and requirements, which is called cross-compliance (ARiMR 2012, Nowak 2013). The requirement of conforming to the standards of animal welfare has been in force since 1 January 2013 (Pośniak-Sobczyńska 2011). Farmers keeping calves should ensure that the humidity and concentration of harmful gases in the premises be at an acceptable level; also, adequate lighting should be provided. Moreover, the

farmer should pay attention in terms of stocking density, appropriate sizes and technical solutions of the premises, manure removal system, and should also provide for adequate care to animals and a proper arrangement of the technological equipment used in the production cycle. Failure to comply with cross-compliance requirements results in a reduction or withdrawal of direct payments (Pośniak-Sobczyńska 2011, Nowak 2013). Cross-compliance checks in Poland are carried out by the Agency for Restructuring and Modernisation of Agriculture, as well as the Veterinary Inspection. The role of the latter is also to supervise the livestock facilities in terms of animal welfare (ARiMR 2012).

Calves housed indoors should be inspected twice a day and those managed outdoors at least once a day. According to the Regulation of the Minister of Agriculture and Rural from 2010, young cattle of up to 6 months of age can not be confined, except when feeding: in group pens and for 1 h only. Exemptions from these requirements include sick or injured animals, calves under maternal nursing, or farms which manage fewer

than six calves. Nevertheless, all calves under 2 weeks of age, regardless of herd size, must be kept on bedding ([www.mrirw.gov.pl](http://www.mrirw.gov.pl)). The farmer is obliged to ensure adequate microclimate parameters in calf premises (Rozporządzenie...). Calf barns should be equipped with mechanical ventilation or should be well ventilated naturally ([www.mrirw.gov.pl](http://www.mrirw.gov.pl)).

The farmer's duty is to ensure that the equipment of the calf barn is constructed of materials which do not affect the animal's health. The equipment and all structures in the calf barn should be in good condition, never causing injuries. The floor should be stable, providing good traction, even and hard, with no bumps or holes. Calf barns should be well lit between 9.00 am and 5.00 pm, with adequate protection against pests, manure and uneaten feed remains being removed once a day (ARiMR 2012).

Calves are to be kept individually or in groups. During the period of milk feeding (until 2 months of age), calves should be kept individually. Council Directive 2008/119/EC states that the width of an individual calf pen shall be at least equal to the calf's height at the withers, while its length shall be at least equal to the body length of the calf, multiplied by 1.1. In such pens, calves may stay until the age of 8 weeks. According to Juszczak and Zalewski (1986), the length of an individual pen for the calf should be 120–150 cm, width 80–110 cm and height 150 cm. Group pens are used for older, 3 to 6 month-old calves, which are fed solid feeds (Juszczak et al. 1982, Lenard 1982). Tethering calves is not recom-

mended (Systemy utrzymania bydła... 2004). Both individual and group pens should be designed to maximally facilitate manure removal, cleaning and disinfection. Calves shall be provided with sufficient air exchange in the barn (Systemy utrzymania bydła... 2008).

Pens should be designed in such a way that the calves may be readily accessible to workers, and the walls should allow the calves to have direct visual and tactile contact with one another. It is recommended that the openings of the drinkers and feeders be placed approximately 20 cm above the floor, so that the calves will not be able to step with their front legs on the containers with water or feed. Appropriate urine drainage should also be provided in order to keep the bedding dry (Systemy utrzymania bydła... 2008). The slope of the floor in the pen should be 5–10%, so as to ensure a good outflow of liquid manure. A good solution is also the hay rack placed in the pen (Romaniuk 1986).

According to Council Directive 2008/119/EC, healthy calves that attained 8 weeks of age should be kept in groups. The space allowance available to each calf kept in group pens shall be as follows: at least 1.5 m<sup>2</sup> for a calf of less than 150 kg live weight, at least 1.7 m<sup>2</sup> for a calf of a live weight of 150–220 kg, and at least 1.8 m<sup>2</sup> for each calf of a live weight of 220 kg or more. According to Juszczak and Zalewski (1986), the floor space in a group pen should be between 2.5 and 3.5 m<sup>2</sup> per calf.

The results reported by Szewczyk and Walczak (2008) show that a high

level of calf welfare may be achieved in group pens with deep bedding and an outdoor run. Individual pens on slatted floor provide a poor level of comfort.

The aim of the study was to estimate the level of welfare parameters in calf-rearing holdings and compare them with the cross-compliance requirements.

#### MATERIAL AND METHODS

The survey was carried out in calf accommodation facilities in 46 farms. The number of calves held in each farm varied. Since the welfare requirements in terms of calves kept in individual or group pens (Rozporządzenie...) apply to farms that keep more than six calves, the study involved 27 barns housing six calves or more and 19 barns which housed up to six calves.

The measurements were carried out during the winter 2012–2013 in farms managing calves located in Tomaszów Mazowiecki County, Łódź Voivodship, Poland. All measurements were performed between 9.30 am and 3.00 pm. A single measurement of harmful gases concentration, i.e. carbon dioxide, ammonia and hydrogen sulfide, was taken in all the studied calf premises. We used the Gas Hunter IR (Alter, Poland), which allows a simultaneous measurement of three gases (in ppm). Relative air humidity (%) and light intensity (lx) were measured using the DT-8820 multifunctional measuring instrument. Light intensity was measured at the height of a calf's head.

Information on the floor type was collected, whether calves were housed

on slatted floor or bedding. The housing conditions of calves were also checked for compliance with the EU regulations. We checked whether: (a) the farm has fewer than six calves; (b) calves are tethered; (c) calves up to 8 weeks of age are kept individually; (d) individual boxes for calves have appropriate dimensions; (e) calves older than 8 weeks are kept in groups; (f) whether calves kept in groups are provided with enough space. The mean values and standard deviations were calculated by using the Microsoft Excell software. The percentage distribution of the analyzed data is depicted on the graphs.

#### RESULTS AND DISCUSSION

##### **Gas concentrations in calf premises against EU standards**

Carbon dioxide inside livestock buildings comes mainly from the air exhaled by animals, but also from the bedding and manure (Kośła 2011). With insufficient ventilation, or lack thereof, the concentration of carbon dioxide may increase considerably (Kołaczkowski and Dobrzański 2006). According to Regulation of the Minister of Agriculture and Rural Development from 2010, CO<sub>2</sub> concentration in the premises for calves should not exceed 3,000 ppm. Our research shows that CO<sub>2</sub> concentrations remained in the range from 530 to 4,000 ppm, with the average 1,983 ppm (Table). In 13% of holdings (six calf barns), the concentration exceeded 3,000 ppm. The remaining 40 holdings kept calves in the atmosphere with the concentrations of carbon dioxide from 530 to 3,000 ppm.

TABLE. Mean gas concentrations in calf barns compared with EU requirements  $n = 46$ 

Gas	Mean gas concentration (ppm)	SD	Acceptable concentration (ppm)
CO <sub>2</sub>	1 983	814	3 000
NH <sub>3</sub>	4.91	4.07	20
H <sub>2</sub> S	0.31	0.85	5

Ammonia in livestock premises comes from decaying animal manure. Higher temperatures intensify the decomposition of urea, resulting in a higher concentration of ammonia in the air (Kośła 2011). A high ammonia concentration in livestock houses is linked to insufficient rate of feces and urine removal. High temperature promotes NH<sub>3</sub> production. A high level of ammonia in the air has a significant effect on the respiratory system, leading to irritation mucous membranes and conjunctiva. At ammonia concentrations of 30–100 ppm, symptoms like tachypnea, excessive mucus secretion and even bronchial swelling. Moreover, with its high content in the air, NH<sub>3</sub> becomes a medium for the bacteria *Pasteurella multocida*, which infect the nostrils and respiratory tracts of the calves. Extremely high concentrations of ammonia affect the nervous system (Kołaczkowski and Dobrzański 2006).

According to Regulation of the Minister of Agriculture and Rural Development from 2010, the concentration of ammonia in the rooms where calves are kept should not exceed 20 ppm. Measurements carried out in 46 calf barns have shown that all the studied holdings comply with this requirement (Table).

Ammonia concentrations remained in the range of 0–17 ppm, with the average level 4.9 ppm.

The smell of hydrogen sulphide is described as the odor of rotten eggs. The gas comes is a product of protein decomposition in the feces of animals (Kośła 2011). Hydrogen sulphide is a toxic gas, especially in combination with high air humidity and ammonia. High concentrations of hydrogen sulphide cause respiratory diseases, conjunctivitis, malfunctioning of the digestive system and the nervous system, which results in reduced immunity. Despite its odor, the gas is difficult to detect without a proper instrument, even with high levels of concentration (Kołaczkowski and Dobrzański 2006). According to Regulation of the Minister of Agriculture and Rural Development from 2010, the concentration of hydrogen sulfide in calf premises should not exceed 5 ppm. Our measurements indicate that the concentration of hydrogen sulfide in the studied barns remained within normal limits (Table). The average concentration of hydrogen sulfide in all the calf barns was 0.31 ppm, within the range of 0–5 ppm. No hydrogen sulfide has been detected in 59% of the holdings.

### **Illumination in calf premises**

Sunlight is the best source of illumination when it comes to livestock animals. It kills bacteria, enhances performance of the animals and improves their comfort. Under solar UV radiation, the skin produces vitamin D<sub>3</sub>, essential for proper development of young animals. The

recommend window-to-floor area ratio in calf premises is 1 to 18–20 (Kośła 2011). It must be kept in mind that the larger the window-to-floor area ratio, the lower heat insulation parameters of the building. If the windows are not properly cleaned, as much as 50% of the entering sunlight can be lost. Also the walls must be maintained clean, since dirty walls absorb rather than reflect light and, in consequence, the room are darker (Wojciechowski 1984). No trees, silos or other building should be located in the proximity of the windows. Windows are usually placed above the level of the animals. It is recommended that they were mounted as high as possible. Door frames, window frames, roof eaves, or thick walls should not reduce the amount of incoming light. Artificial lighting in cattle premises is complementary to natural light. Adequate power of artificial light must be ensured. Lamps should be spaced along the interior of the building so as to provide equal visibility in every place (Kończak and Dobrzański 2006).

According to Regulation of the Minister of Agriculture and Rural Development from 2010, the calves must have access to light from 9.00 am to 5.00 pm. The provisions, however, do not specify the parameters of the incoming light. Information cards of the National Research Institute of Animal Production (Karta informacyjna... 1977) recommend that light intensity in calf premises should be at least 15–30 lx. In our study, all the holdings except one (10 lx) provided calves with adequate lighting (Fig. 1).

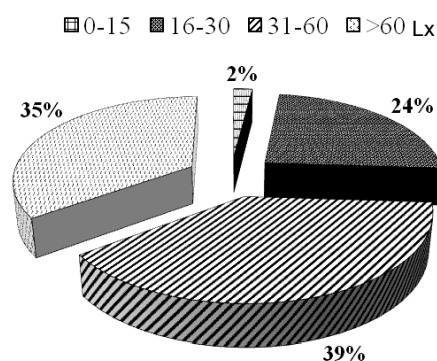


FIGURE 1. Lighting in calf barns

#### Air humidity in calf premises

Recommendations of the Information cards of the National Research Institute of Animal Production (Karta informacyjna... 1977) state that the optimal level of relative humidity inside buildings for dairy cattle and calves should remain between 60 and 80%.

The level of air humidity in barns depends on the ventilation applied, thermal insulation of the walls, outdoor temperature, the number of animals, manure removal system, the substrate on which the animals are kept, and water content in the feed (Romaniuk 1986). Most humidity in livestock buildings, as much as 75%, come from moisture emitted by animals (Płaszczenko and Chochłowa 1981, Kośła 2011).

In some animal housing facilities air humidity is so high that water vapor may condense on the ceiling and walls. This is the case especially if the building lacks thermal insulation of the walls (Juszczak and Zalewski, 1986). High humidity levels promote the transfer and prolifera-

tion of bacteria, which is dangerous particularly for young cattle. The immune system of calves is not fully developed, which is particularly dangerous in terms of health (Systemy utrzymania bydła... 2004). High humidity, especially in combination with low temperatures, has a negative effect on the animals. In such conditions, animals reveal reduced feed intake, loss of performance and problems with respiration. In winter, this can lead to a common cold, pneumonia, as well as muscular and articular rheumatism. High humidity levels along with high temperatures hamper the body thermoregulation. This in turn results in a general performance decrease, but may also cause digestive tract disorders and lethargy (Plaszczenko and Chochłowa 1981).

Our results (Fig. 2) have shown that relative humidity was too high in 15% of holdings with calf premises, and too low in 4% of the farms. In 81% of the holdings, however, the levels of air relative humidity were at their optimum.

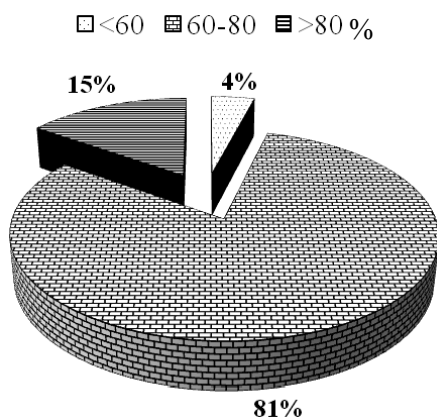


FIGURE 2. Indoor air relative humidity in calf barns

### Calf housing systems against EU requirements

According to Regulation of the Minister of Agriculture and Rural Development from 2010, calves must not be tied up, except for feeding, when animals can be kept in groups for 1 h. If the farm operator applies this confinement during feeding, it must be ensured that the tether does not cause injuries of any sort. Calves must not be muzzled (ARIMR 2012). The collected data show that 54% of the studied holdings apply tethering (Fig. 3), which is incompatible with EU requirements.

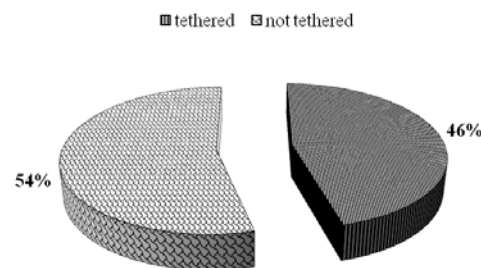


FIGURE 3. Housing systems of calves (tethered and not)

Szewczyk and Walczak (2008) conducted welfare studies on calves at age 7 to 90 days kept in two different housing systems: individually or in groups. A high level of welfare was observed in calves kept in groups on deep bedding, whereas the lowest was found in calves kept individually on slatted floor.

In calf-rearing, the dimensions of the pens are to be adjusted to the age of the calf; recommendations have been provided in a chapter "Introduction". Calves can be kept in individual

pens up to the age of 8 weeks, except for those under maternal nursing, sick, or in the small herds of up to six calves (Rozporządzenie...). In our study, 19 farms managed fewer than six calves. Of 27 farms which were able to keep calves up to 8 weeks of age in individual pens, 30% (eight households) used individual pens (Fig. 4). Other calves were kept confined or in groups (22%). According to Regulation of the Minister of Agriculture and Rural Development

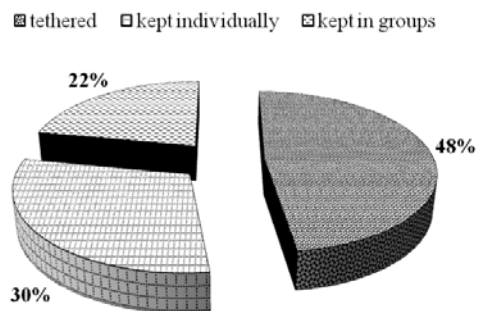


FIGURE 4. Housing systems of calves up to 8 weeks of age

from 2010, an individual calf pen should have appropriate dimensions: the width not lower than calf's height at the withers and the length not less than calf's length multiplied by 1.1. The individual pens for calves in the farms that applied them had dimensions conforming to the regulations.

According to Regulation of the Minister of Agriculture and Rural Development from 2010, calves older than 8 weeks of age – as herd animals – must be kept in groups (Fig. 5). Of all the farms under study, 59% applied group pens, the other used tethering of calves.

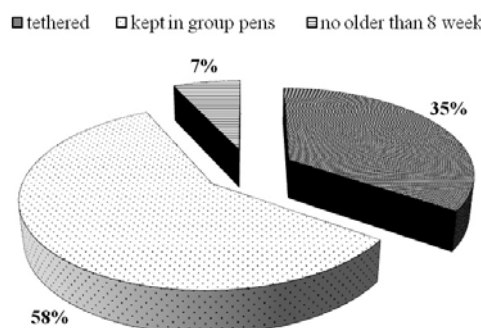


FIGURE 5. Housing systems of calves older than 8 weeks

Three farms did not manage calves in this age range on the day of survey. According to a study by Szweczyk and Walczak (2008), calves kept in groups, especially on deep bedding, reveal a better welfare parameters compared to calves kept on slatted floor and individually.

According to Regulation of the Minister of Agriculture and Rural Development from 2010, calves kept in group pens should have enough space. All the studied farms keeping calves in group pens provided enough space for them.

## CONCLUSIONS

The study allowed assessment of housing conditions of the calves.

1. Concentrations of harmful gases in the majority of calf barns were within the recommendations of the Research Institute of Animal Production.
2. Carbon dioxide concentration in 13% of calf barns exceeded EU requirements and animal husbandry standards.
3. The concentration of ammonia and hydrogen sulfide in the calf barns

remained within EU requirements and animal husbandry standards.

4. Air relative humidity in 81% of the calf barns remained within the standards of good animal husbandry practices.
5. In 54% of farms calves were tethered, which was incompatible with EU standards.
6. Only 59% of farms kept calves from 8 weeks of age according to the standards, i.e. in group pens.

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**Streszczenie:** *Respektowanie unijnych wymogów wzajemnej zgodności jako wskaźnik dobrostanu zwierząt w gospodarstwach utrzymujących cielęta.* Celem pracy było określenie poziomu wskaźników dobrostanu zwierząt i porównanie ich z wymogami wzajemnej zgodności w gospodarstwach utrzymujących cielęta. Badania zostały przeprowadzone w 46 gospodarstwach w okresie zimowym. Przeprowadzono pomiary mikroklimatyczne w cielętnikach, takie jak: wilgotność względna, stężenia szkodliwych gazów, natężenie oświetlenia. Sprawdzono także, czy system utrzymania cieląt odpowiada obowiązującym regulacjom prawnym. Badania pozwoliły na ocenę warunków utrzymania cieląt.

*Słowa kluczowe:* cielęta, mikroklimat, wymogi unijne

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