

THE WELFARE OF GILTS IN DIFFERENT HOUSING SYSTEMS

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Abstract. The aim of this study was to assess the welfare of gilts managed in different housing systems. The material consisted of a total of 160 gilts, weighing between 40 to 100 kg. The study was conducted in 15 pig breeding farms producing gilts in the Podkarpackie Voivodeship, Poland. The gilts were housed in facilities with access to open air (5 piggeries) and without a run (10 pig farms). The welfare of gilts was assessed using behavioral, physiological, health, and production performance criteria. The overall evaluation of welfare was based on designated control points. Summing up the results, we found a higher level of welfare in gilts kept with an access to outside runs. Behavioral responses of gilts managed without an outdoor run involved a higher rate of cases of unusual behavior and more frequent states of anxiety. The serum concentration of haptoglobin in gilts was varied in the studied conditions of living. The lowest average content of Hp was recorded in gilts kept in buildings with outside runs. A higher rate of animals suffered a disease and injuries in the facilities without an access to outdoor runs. Under these housing conditions, frequent problems with the legs (leg lameness and deformation) was an issue. An analysis of critical control points indicates that the welfare of pigs remained at a high level.

Keywords: breeding gilts, management system, outdoor runs, welfare

INTRODUCTION

Modern breeding gilts have a high utility and breeding value [Akińcza 2004, Kapelański and Biegniewska 2009]. It should be kept in mind, however, that due to the high productivity of farm animals, the requirements for their welfare increase. The most common error made during the rearing of gilts is to limit their mobility, which may lead to lower resistance to diseases [Augustyńska-Prejsnar 2010]. If satisfactory production parameters are to be obtained, prior selection of the proper system of housing is necessary, which would stay in compliance with the rules of welfare [Herbut and Walczak 2004, Herbut 2009, Temple et al. 2012].

Evaluation of animal welfare is not an easy task. Previous investigations [Kończak and Bodak 2000, Kowalski 2005, Walczak 2005, Broom 2007] have not agreed on a single, objective index which could be used to judge the housing conditions of animals to ensure

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their proper welfare. The extensive literature [Kołaczk and Bodak 1999, Herbut and Walczak 2004, Broom, 2006, Szymańska-Czerwińska and Bednarek 2007, Herbut 2009] is dominated by the division of welfare markers into behavioral, physiological, health, and production ones. An additional, own welfare assessment can be performed through a comparison of the welfare of gilts in various conditions of living.

The welfare impacts the immune system status. Lack of factors that activate the immune system implies that the level of welfare is high [Kołaczk and Bodak 2000]. Acute phase proteins (APP) are increasingly being used as markers of welfare [Pomorska-Mól 2010 b, Cray 2012]. These proteins can be used for analyzing complex individual and population interactions that affect the performance of the farm animals. In recent years, the possibilities of using APP to assess the living conditions of farm animals have been studied [Pineiro et al. 2009]. Particularly noteworthy is the haptoglobin (Hp), one of the most stable proteins [Petersen et al. 2002 a, Pomorska-Mól 2010 a]. Determination of Hp level facilitates inspection of pig herd health status and allows assessment of the level of welfare [Petersen et al. 2002 b, Szymańska-Czerwińska and Bednarek 2007, Pineiro et al. 2009].

The aim of this study was to assess the level of welfare of gilts housed with or without an access to outdoor runs.

MATERIAL AND METHODS

The study was carried out on 15 piggeries producing breeding gilts located in the Subcarpathian Voivodeship, Poland, in 2008–2010. The material consisted of a total of 160 gilts, weighing between 40 to 100 kg.

The gilts were managed on thin bedding, in buildings with- (5 piggeries) and without outdoor runs (10 piggeries). Gilts were housed in group pens. The stocking density was 3 to 10 pigs per pen in the farms with outdoor runs, 3 to 5 pigs per pen in the piggeries without a run. In the piggeries with outside runs, the area individual living ranged from 0.80 to 3.30 m² per animal (average 2.50 m²), while in buildings without runs from 1.20 to 2.40 m² (average 1.80 m²). Natural lighting index, as measured by the ratio of glazed area of windows to the floor area, was 1:20 in the buildings with runs, and 1:17 in those without a run. All animals were included in a routine preventive procedure.

The welfare of the gilts were evaluated according to the following criteria: behavior, physiology, health, and production performance. The behavioral criterion involved a 24-hour observation of the gilts, which was carried out using a video camera with recorder with time-lapse recording function. Recorded was the appearance of unusual behavior. The physiological criterion consisted in measuring the serum concentration of porcine haptoglobin using radial immunodiffusion kits (Tridelta Development Ltd). The readings were made spectrophotometrically at 630 nm absorbance. The health criterion included an evaluation of the health status of gilts, taking into account the emergence of diseases and injuries of the body, as well as illnesses and injuries of legs. Gilts were subject to standard *in-vivo* assessment performed in pig breeding farms. The evaluation of the production performance of pigs was based on data taken from the herd records and documentation on the

gilts' *in-vivo* evaluation led by the Polish Association of Pig Breeders and Producers "POL-SUS". Production performance-based welfare criterion was rated on the basis of two indicators: daily weight gain and carcass lean percentage. Overall assessment of welfare was based on designated control points. The elements of the environment and production technology determining the level of animal welfare, for which the critical control points were established, involved: pen surface area in m² per animal; freedom of movement (individual pens, group pens, runs); natural lighting of the piggery; access to food and water; isolation and care of sick animals; the occurrence of diseases and injuries in the herd; the occurrence of behavioral stereotypies; supervision of the animals (daily inspection of animals, qualifications of the handling staff, their attitude towards animals); prevention in the herd (sanitation of pens, troughs and drinkers; prophylaxis procedures; quarantine; applying the principle of „whole room full – whole room empty“; disinfection of equipment; using protective clothing for handling of animals); prevention in the herd (disinfection of corridors and means of transport; disinfecting the water supply system, presence of disinfection sluices for both people entering the premises and cars entering the farm; implementation of rat control measures; tight fencing of the farm; proper distance to the nearest group of pigs; storage of solid and liquid manure). Critical control points have been summarized in the form of a scale of welfare classification standards at five levels: very low, low, medium, high and very high. Each critical control point was arbitrarily assigned a rating of 1 to 5 points. The overall assessment of welfare was the average rating of 10 critical control points.

The significance of differences between two percentages of particular unusual behaviors, disease cases and injuries of the body, and illnesses and injuries of legs in the studied housing conditions, was tested using the test for differences between two proportions. In the case of the performance indices, the significance of differences between housing conditions was examined by one-way non-orthogonal design ANOVA. To assess the significance of differences between means, we used the Tukey test. Calculations were performed using the Statistica[®]9.1 package.

RESULTS AND DISCUSSION

Behavior is one of the most reliable criteria for assessing the welfare of animals [Kołacz and Bodak 1999, Dawkins 2006, Broom 2007, Courboulay et al. 2009, Herbut 2009, Kozeira et al. 2009]. The results of the observations of non-typical behavior of gilts in the tested housing conditions are shown in Table 1. The highest rate of animals showing abnormal behavior (41.00%) was found among the gilts held without access to an outside run. Under both housing systems, the gilts often demonstrated a state of anxiety. Anxious behavior occurred more often (43.59%) among animals raised without the access to runs, the results being confirmed statistically. Mutual biting was observed among the gilts (6.06% of cases). According to Glanc et al. [2006] and Jensen et al. [2010], reduction of living area triggers aggression and leads to a strong stress response. Significantly more cases involving sham chewing (14.73%), standing still and listening (22.70%), were found in the examined gilts

kept in piggeries with outside runs (Table 1). Observed unusual behavior can be considered as a general symptom of a behavioral adaptation of the animals to the environment [Kowalski 2005].

Table 1. Abnormal behaviors of gilts in examined housing systems

Tabela 1. Zachowania nietypowe loszek hodowlanych w badanych systemach utrzymania

Item Wyszczególnienie	Housing system System utrzymania	
	with outside runs z wybiegami	without outside runs bez wybiegów
Ratio of animals with abnormal behaviors, % Wskaźnik zwierząt wykazujących zachowania nietypowe, %	27.00	41.00
Forms of behavior, %: Formy zachowań, %:		
– anxiety – nerwowość	35.58*	43.59*
– mutual biting – wzajemne kąsanie	0.00	6.06
– continuous sniffing – ciągle węszenie	11.04	10.96
– hitting fixed objects – uderzenia o elementy stałe	0.00	2.56
– sham chewing – pozorowane żucie	14.73*	7.46*
– bar licking and biting – lizanie i gryzienie kojców	4.29	6.06
– snout jostling – trącanie ryjem	8.59	8.39
– bar dubbing – ocieranie o kraty	3.07	5.13
– still standing and listening – stanie w bezruchu i nasłuchiwanie	22.70*	9.79*

* test value significant at $P \leq 0.05$ – * wartość testu istotna przy $P \leq 0,05$.

The level of serum haptoglobin in pigs is expressly modified by the conditions in which animals stay [Knura et al. 2000, Saco et al. 2010]. According to the literature [Kończak and Bodak 2000], the lowest value of Hp is considered a sign of the appropriate level of welfare, regardless of the animal species, age, gender, weight, or nutrition. Lower average content of haptoglobin (0.709 mg per ml), and thus a higher level of welfare, was observed in gilts kept with outdoor runs (Table 2). The concentration of haptoglobin in the serum of gilts held without access to open air varied from 0.263 ($\text{mg} \times \text{ml}^{-1}$) to 2.252 ($\text{mg} \times \text{ml}^{-1}$).

Table 2. Haptoglobin concentration ($\text{mg} \times \text{ml}^{-1}$) in blood serum of the in examined housing systemsTabela 2. Koncentracja haptoglobiny ($\text{mg} \times \text{ml}^{-1}$) w surowicy loszek hodowlanych w badanych systemach utrzymania

Housing system System utrzymania	Value Wartość		
	min.	mean – średnia	max
With outside runs Z wybiegami	0.016	0.709	2.421
Without outside runs Bez wybiegów	0.263	1.225	2.252

Health of pigs is an important indicator of the welfare [Kołacz and Bodak 1999, Broom 2007, Herbut 2009]. A higher proportion of animals that experienced illnesses and injuries was found in objects without access to outdoor runs (53.00%). Skin abrasions dominated among injuries diagnosed in the gilts. More such cases (56.14%) were observed in the housing allowing the pigs an outdoor run. In contrast, skin injuries predominated (21.04%) in gilts held without an access to runs. The results were confirmed statistically. Shoulder blade and groin injuries accounted for 7.07% injuries of pigs housed without a run and 5.26% in pigs with an access to a run. An injury may be a result of aggression or stereotypies seen in an unfavorable environment for the animals [D'Silva 2006, Jensen et al. 2010, Augustyńska-Prejsnar 2011]. Lack of outdoor runs, which limits the manifestation of natural behaviors, like rooting, can trigger strong frustrations in pigs [Glanc et al. 2006]. According to Kaleta [2003] and Kowalski [2005], aggression arises – besides reduced living area – from overcrowding. In the studied gilts, tail injuries appeared more often if pigs were housed without the access to runs (4.02%) and had a superficial character. Studies by Kapelański et al. [1993] showed that injuries of the anterior parts of the body (head, ears and neck) were most common during the rearing. In our study, the percentage of gilts with injuries of the neck and surrounding area was at a similar level (Table 3). According to Kaleta [2003], normal growth and undisturbed ability to reproduce is a sign that the animal does well with the environment. Otherwise we can expect deterioration of health and visible injuries.

The rate of animals with diseases and injuries of legs ranged from 9.31%, in pigs with an access to run, to 17.35%, for those without runs (Table 4). The diseases and injuries of legs were mostly those related to hoofs. More cases of hoof abrasion (61.54%) and lameness (30.77%) were recorded in piggeries with runs. The high growth rate in growing pigs favors the occurrence of lameness in this species [Augustyńska-Prejsnar 2011]. Significantly more cases of leg deformation (12.09%) were found in gilts held without outdoor runs. Deformity of legs is a result of a complex of symptoms of leg weakness, and one of the etiological factors of this phenomenon is the inability to move, especially during their growth [Gajewczyk 2001]. In the studied gilts, contusions and fractures of legs were observed only in those managed without the runs (Table 4).

Table 3. Diseases and injuries of the gilts body in examined housing systems
 Tabela 3. Zachowania nietypowe loszek hodowlanych w badanych systemach utrzymania

Item Wyszczególnienie	Housing system System utrzymania	
	with outside runs z wybiegami	without outside runs bez wybiegów
Ratio of animals with diseases and injuries of the body, % Wskaźnik zwierząt ze schorzeniami i urazami ciała, %	45.00	53.00
Diseases and injuries, %: Schorzenia i urazy, %:		
– skin abrasions – otarcia skóry	56.14	45.32
– skin injuries – okaleczenia skóry	17.10*	21.04*
– shoulder blade and groin injuries – okaleczenia łopatki i pachwiny	5.26	7.07
– tail injuries – okaleczenia ogona	2.63	4.02
– neck and nape injuries – zranienia okolic szyi i karku	6.14	5.16
– claw abrasions – otarcia racic	8.33	9.94
– lameness – kulawizna	3.52	3.82
– leg deformations – zniekształcenia kończyn	0.88	2.10
– leg fractures and contusions – kontuzje i złamania kończyn	0.00	1.53

* test value significant at $P \leq 0.05$ – * wartość testu istotna przy $P \leq 0,05$.

Productivity (yield) of livestock animals is an important criterion in the assessment of welfare [Walczak 2005]. The values of such characteristics of the gilts are presented in Table 5. The results obtained in the studied conditions turned out to be statistically non-significant.

The comparison of the welfare of gilts was based on the scores (Table 6). In all gilts, regardless of the housing conditions, handling of animals and access to food and water were rated very high. In addition, housing without outdoor runs scored the highest rating for the isolation and care of the sick animals. Shortcomings in the system without the runs were found only in the freedom of movement and preventive measures. In these control points welfare reached a low level. The overall evaluation as expressed in score indicates that the welfare of the gilts reached a high level in both housing systems, i.e. with and without outside runs.

Table 4. Diseases and injuries of the legs in gilts in examined housing systems

Tabela 4. Schorzenia i urazy kończyn loszek hodowlanych w badanych systemach utrzymania

Item Wyszczególnienie	Housing system System utrzymania	
	with outside runs z wybiegami	without outside runs bez wybiegów
Ratio of animals with diseases and injuries of the legs, % Wskaźnik zwierząt ze schorzeniami i urazami kończyn, %	9.31	17.35
Diseases and injuries, %: Schorzenia i urazy, %:		
– hoof abrasions – otarcia racic	61.54	57.14
– lameness – kulawizna	30.77	21.98
– leg deformations – zniekształcenia kończyn	7.69*	12.09*
– leg fractures and contusions – kontuzje i złamania kończyn	0.00	8.79

* test value significant at $P \leq 0.05$ – * wartość testu istotna przy $P \leq 0,05$.

Table 5. The productive performance of gilts in examined housing systems

Tabela 5. Cechy użytkowe loszek hodowlanych w badanych systemach utrzymania

Item Wyszczególnienie		Housing system System utrzymania	
		with outside runs z wybiegami	without outside runs bez wybiegów
Daily gain, g Przyrosty dzienne, g	mean średnia	604.15	599.42
Daily gain, g Przyrosty dzienne, g	SD	40.96	48.18
Lean meat percentage, % Procent mięsa w tuszy, %		55.53	55.80

SD – standard deviation – SD – odchylenie standardowe.

Table 6. Welfare level of gilts based on assigned critical points of control, pts
 Tabela 6. Poziom dobrostanu loszek hodowlanych na podstawie wyznaczonych punktów kontroli, pkt.

Critical control points Krytyczne punkty kontroli	Housing system System utrzymania	
	with outside runs z wybiegami	without outside runs bez wybiegów
Area of pen in square meters per one animal Powierzchnia kojca w m ² przypadająca na zwierzę	3	3
Freedom of movement Swoboda ruchu	5	2
Natural lightening in hoggerly Oświetlenie naturalne chlewni	4	4
Food and water access Dostęp do paszy i wody	5	5
Sick animals isolation and care Izolacja i opieka nad zwierzętami chorymi	4	5
Disorders and injuries occurring in herd Występowanie schorzeń i urazów w stadzie	3	3
Stereotypic behavior occurred Występowanie stereotypii behawioralnych	4	4
Supervision of animals Nadzór nad zwierzętami	5	5
Stock prophylaxis Profilaktyka w stadzie	4	3
Stock prevention Prewencja w stadzie	3	2
General score of welfare Ogólna ocena poziomu dobrostanu	4.00	3.60

CONCLUSIONS

To sum up the results, we found a higher level of welfare in gilts kept with an access to outdoor runs. Behavioral responses of gilts maintained without the runs involved a higher ratio of animals showing abnormal behavior, and more frequent states of anxiety. The serum concentration of haptoglobin in the gilts was varied between the studied conditions of living. The lowest average content of Hp was recorded in gilts managed in buildings with outside runs. A higher rate of animals suffering illnesses and injuries was found in the piggeries without access to outside runs. Under these housing conditions, problems with the legs (leg lameness and deformations) were more frequent. An analysis of critical control points indicates that the welfare of the studied pigs remained at a high level.

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DOBROSTAN LOSZEK HODOWLANYCH W RÓŻNYCH SYSTEMACH UTRZYMANIA

Streszczenie. Celem przeprowadzonych badań była ocena poziomu dobrostanu loszek hodowlanych w różnych systemach utrzymania. Materiał badawczy stanowiło łącznie 160 loszek

hodowlanych, w przedziale wagowym od 40 do 100 kg. Badania prowadzono w 15 chlewniach zarodowych produkujących loszki hodowlane w województwie podkarpackim. Loszki hodowlane utrzymywano z dostępem do wybiegów (5 chlewni) i bez możliwości wybiegów (10 chlewni). Dobrostan loszek hodowlanych oceniano za pomocą kryterium behawioralnego, fizjologicznego, zdrowotnego, produkcyjnego. Ogólnej oceny poziomu dobrostanu dokonano na podstawie wyznaczonych punktów kontroli. Podsumowując uzyskane wyniki, stwierdzono wyższy poziom dobrostanu u loszek hodowlanych w utrzymaniu z wybiegami. Reakcją behawioralną loszek na utrzymanie bez wybiegów był wyższy wskaźnik zwierząt wykazujących zachowania nietypowe oraz częstsze stany nerwowości. Koncentracja haptoglobiny w surowicy loszek była zróżnicowana w badanych warunkach utrzymania. Najniższą średnią zawartość Hp odnotowano u loszek utrzymywanych w budynkach z wybiegami. Wyższy wskaźnik zwierząt, u których wystąpiły schorzenia i urazy ciała, stwierdzono w utrzymaniu bez dostępu do wybiegów. W tych warunkach utrzymania częściej pojawiały się problemy z kończynami (kulawizny i zniekształcenia kończyn). Analiza krytycznych punktów kontroli wskazuje, że dobrostan badanych świń utrzymywał się na poziomie wysokim.

Słowa kluczowe: dobrostan, loszki hodowlane, system utrzymania, wybiegi

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