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THE EFFECT OF VARYING DISTANCES FROM THE WIND TURBINE ON MEAT QUALITY OF GROWING-FINISHING PIGS*

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Abstract

This study was conducted to assess the effect of rearing pigs at three different distances from a wind turbine (50, 500 and 1000 m) on the physicochemical properties and fatty acid composition of loin and neck muscles. The experiment was carried out on 30 growing-finishing pigs, derived from Polish Landrace × Polish Large White sows mated to a Duroc × Pietrain boar. The results obtained during the noise measurement showed that the highest level of noise in the audible and infrasound range was recorded 50 m from the wind turbine. Rearing pigs in close proximity to the wind turbine (50 m) resulted in decreased muscle pH, total heme pigments and heme iron as well as reduced content of C18:3*n-3* fatty acid in the loin muscle. Loins of pigs reared 50 m from the wind turbine were characterized by significantly lower iron content (6.7 ppm g^{-1}) compared to the loins of pigs reared 500 and 1000 m from the wind turbine (10.0–10.5 ppm g^{-1}). The concentration of α-linolenic acid (C18:3*n-3*) in loin and neck muscles decreased as the distance from the wind turbine increased. Avoiding noise-induced stress is important not only for maintaining meat quality but also for improving animal welfare.

Key words: pigs, noise-induced stress, muscles, physicochemical properties, fatty acid composition

Farm animals experience some level of stress during the fattening period and prior to slaughter and this may have detrimental effects on meat quality. The magnitude of the effect is generally thought to be a function of the type, duration and intensity of the individual stressors and the susceptibility of the animal to stress (Ferguson et al., 2001). As reported by Ognik and Sembratowicz (2012), intensified and long-lasting stress induces disorders in a daily rhythm of hormones secretion, physiologi-

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cal and morphological changes. These, in turn, are manifested mainly in changes of blood composition, changes in muscle tissue and formation of meat defects. The study performed by Wojtas et al. (2014) demonstrated that heat stress leads to serious changes in physiological and blood parameters in sheep. Yang et al. (2014) indicated that constant heat stress disrupted the pro/antioxidant balance in *longissimus dorsi* muscle with higher malondialdehyde (MDA) content and lower antioxidant capacity.

Noise as a stress factor has been shown to reduce the quality of farm animals life (Chai et al., 2010; De la Fuente et al., 2007; Voslarova et al., 2011). There is experimental evidence that noise exposure may be a potential stressor in farm animal husbandry. The results of the study performed by Kanitz et al. (2005) indicated that exposure of domestic pigs to repeated noise stress caused changes in neuroendocrine regulations, which are characterized by temporal alterations in the responsiveness of the hypothalamic-pituitary-adrenal (HPA) system. They concluded that repeated exposure of pigs to noise levels of 90 dB affected HPA function and resulted in a state of chronic stress that may have negative implications on animal productivity and welfare. Chloupek et al. (2009) also determined a significant negative influence of noise exposure (80 and 100 dB) on the stress and fearfulness of broiler chickens. According to a study performed by Otten et al. (2004) pigs exposed to 90 dB prolonged or intermittent noise increased cortisol, noradrenaline to adrenaline ratio. Pigs are very sensitive to noise and they should not be exposed to constant or sudden noise. Therefore, noise levels above 85 dB must be avoided in buildings where pigs are kept (Fottrell, 2009).

However, there has been little examination of the consequences of the exposure to noise generated by wind turbine on animal health and consequently meat quality. Wind turbines generate audible noise and infrasound which may affect the level of stress in animals, and consequently meat quality (Mikołajczak et al., 2013). Preliminary studies on the reaction of growing geese to the proximity of wind turbines indicated the negative impact of the immediate vicinity of wind turbines on feed consumption, weight gain and cortisol concentration in blood (Mikołajczak et al., 2013). Results of their study suggested a negative effect of the immediate vicinity of a wind turbine on the stress parameters of geese and their productivity. Many previous studies (Choi et al., 2012; De Weerth and Buitelaar, 2005; Kalra et al., 2007) have shown the relationship between cortisol levels and meat quality and generally considered as the primary biomarker of stress (Russell et al., 2012).

In addition, our previous research indicated that noise generated by the wind turbine affected the quality of muscles and the fatty acid profile of abdominal fat of geese (Karwowska et al., 2014). The results showed that the muscles of geese reared at a distance of 50 meters from the wind turbine were characterized by higher pH and TBARS values compared to those reared at a distance greater than 50 m from the wind turbine.

This point seems to be particularly important, as wind energy sector has shown strong growth in the world. By the year 2020, wind turbine installations in the European Union will increase 64% compared to 2013 levels (The European Wind Energy Association, 2014). In this scenario, livestock is expected to be increasingly exposed to factors generated by the wind turbine.

Avoiding stress is important not only for maintaining meat quality but also for improving animal welfare. Animal welfare is defined as providing environmental conditions in which animals can display all their natural behaviors and has been very important in animal production (Koknaroglu and Arkunal, 2013). It is believed that wind energy development may affect animal welfare. Due to the lack of regulations in Poland, wind turbines are often built in close proximity to residential areas and livestock buildings. Thus, animals are exposed to long-lasting stressors generated by wind turbines.

In view of this evidence, we hypothesized that the muscles derived from pigs reared near a wind turbine can be characterized by altered properties determining its suitability for processing. The aim of our research was to assess the effect of rearing pigs at three different distances from the wind turbine (50, 500 and 1000 m) on the physicochemical properties and fatty acid composition of loin and neck muscles.

Material and methods

Animals and their treatment

The experiment was performed on 30 growing-finishing pigs derived from Polish Landrace × Polish Large White sows mated to a Duroc × Pietrain boar. Animals were allotted to 3 experimental groups, each comprising 10 pigs (5 gilts and 5 boars). Animals of each group were reared at varying distances from the wind turbine (with a capacity of 2 MW) in Rapałki near Rypin (Kuyavian-Pomeranian Voivodeship, Poland). Pigs of group I (G-I) were reared at the distance of 50 meters from the wind turbine; group II (G-II) – at the distance of 500 meters from the wind turbine; group III (G-III) – at the distance of 1000 meters from the wind turbine (Figure 1). The same fattening conditions were applied in each experimental group. During the experiment, animals were kept in specially adapted metal sheds that provide protection from external weather conditions such as rain, wind, direct sunlight. Pigs of each group were kept in identical straw bedded pens and were fed identically twice daily, with a commercial complete diet. The fatteners received the same amount of feed, subject to body weight. During the trial, animals had free access to water. The Local Ethic Committee for Experiments with Animals approved all of the experimental procedures relating to the use of live animals. At the end of the fattening period which lasted from about 30 to 80–90 kg body weight (group I – 80.3±2.2; group II – 82.5±3.2, group III – 90.0±3.1) all pigs were slaughtered.

At the abattoir, animals were allowed a 3-hour rest period with full access to water but not to feed. Then, pigs were slaughtered according to standard commercial procedures and split down the midline. The carcass sides were refrigerated in line processing at 2°C. At approximately 1 hour postmortem, two primal cuts: loin (*m. longissimus dorsi* from the area of the last thoracic and first lumbar vertebrae) and the top of the neck (*m. biventer cervicis*, *m. splenius*) were excised from five carcasses of each experimental group (3 gilts and 2 boars). The primal cuts were packed individually into high density polyethylene bags (HDPE) and subjected to evaluation after 3 days of postmortem ageing at +4°C.

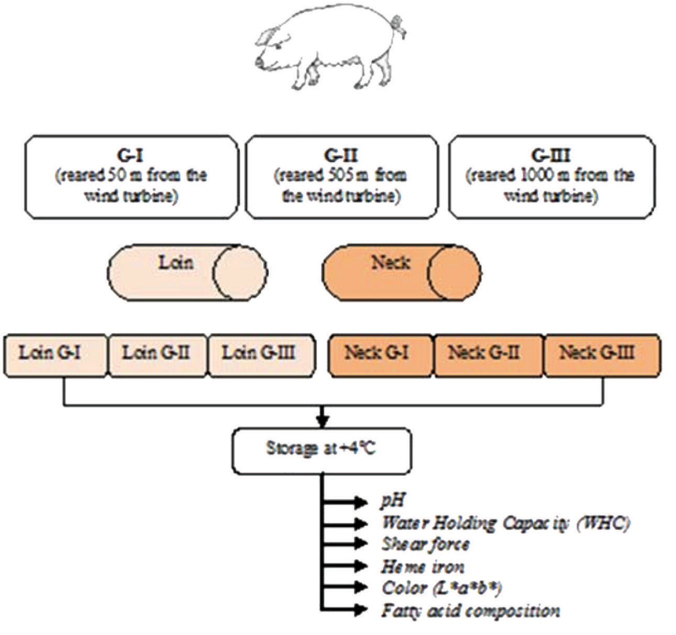

Figure 1. Schematic representation of the experimental design

Measurement of noise generated by wind turbine

During the experiment, the measurements of noise generated by wind turbine were carried out. The noise has been measured inside the sheds. Measurements were taken during the resting phase in order to eliminate the noise generated by animals. Both audible sound and infrasound were measured using a class I sound and vibration analyzer (Svantek SVAN 912 AE).Two different scales were used to weigh all frequencies that are emitted by wind turbine: most audible noises were weighed with the A scale, dB (A), infrasound was weighed with the G scale, dB (G). The noise was measured in each pen in 5 replicates.

Raw meat quality analysis

Measurement of pH

To measure pH, 10 g of minced meat was homogenized with 100 mL of distilled water for 1 min using a homogenizer (IKA Ultra-Turrax T25 Basic, Germany). The pH was measured with a digital pH-meter CPC-501 (Elmetron, Poland) equipped with a pH electrode (ERH-111, Hydromet, Poland). The pH-meter was calibrated with buffer solutions at pH 4.0, 7.0 and 9.0, before pH measurements.

Determination of water holding capacity (WHC)

Measurement of WHC was performed using a centrifugation method (Wierbicki et al., 1962). 50 g of minced meat samples was homogenized with 50 ml of distilled water for 1 min using a homogenizer (IKA Ultra-Turrax T25 Basic, Germany). The homogenates were then centrifuged at 1500 g for 20 min using a MPW-350R centrifuge (MPW Med-Instruments, Poland). Water holding capacity was calculated as: WHC=(M1−M2)/M3×100%, where: M1 – weight of added water (g); M2 – weight of supernatant after centrifugation; M3 – weight of meat in homogenate (g).

Total heme pigments and heme iron determination

A chemical analysis of the total heme pigments from a minced sample of the muscles was carried out to determine the parts per million of hematin per gram of muscle using the method described by Hornsey (1956), with spectrophotometer readings (Nicolet Evolution 300, Thermo Electron Corporation) of absorbance at 640λ. The heme iron content was calculated as described by Clark et al. (1997): Heme iron (ppm g^{-1} meat) = total pigment (ppm g^{-1} meat) × 8.82/100.

Color measurements

Color (L* a* b*) was assessed on the freshly cut surface of meat samples using an XRite Color® Premiere 8200 colorimeter (X-Rite Incorporated, Michigan, USA) with a D65 illuminant and a 10° standard observer (AMSA, 1991). Samples for color measurements were 5 cm thick and excited at the depth of 20 mm. Before color determination, meat samples were wrapped in an oxygen permeable polyethylene film. Every time before use, the instrument was calibrated against a white ceramic calibration tile with the specification of L* = 95.87, a* = –0.49, b* = 2.39 that was wrapped in the same polyethylene film used for the muscle samples, and a light trap.

Fatty acid analysis

Fatty acid profile of meat samples was determined by gas chromatography after conversion of the fats to fatty acids methyl esters (AOCS, 1997). The method of Folch et al. (1957) was used for the extraction of lipids from samples. The fatty acids methyl esters (FAME) were quantified by gas chromatograph method using a fused silica capillary column (Select ™ Biodiesel for FAME, Varian, USA) (30 m × 0.32 mm × 0.25μm film thickness) and flame-ionization detector Varian 450-GC (Varian, USA) at injection volume of 1 mL/min and split ratio 1/50, respectively. Helium was used as the carrier gas. The detector and injector temperatures were chosen as 300°C and 250°C, respectively. The initial column temperature of 150ºC was held for 1 min, increased to 200ºC at 3ºC/min and held for 10 min. Then, it was increased to 240ºC at the rate of 3ºC/min and maintained for 4 min. Quantification of lipid FAMEs was carried out using nonadecanoic acid (C19:0) as an internal standard.

Heat-treated meat quality analysis

Heat-treated meat sample preparation

The loin and neck muscle samples (about 200±10 g) were cured using 2.0% curing mixture (99.5% NaCl, 0.5% sodium nitrite) at 4°C for 24 hours. The samples were individually wrapped in aluminium foil and placed in the oven for roasting at 180°C to an internal temperature of 72°C. The temperature was monitored by chromium-aluminium thermocouples. The muscle samples were cooled and blotted dry. After that, the heat-treated muscle samples were packed individually into the HDPE bags and stored at 4°C overnight.

Shear force measurements

Cylindrical cores (1.25 cm diameter) were cut from the heat-treated muscles, parallel to the longitudinal orientation of the muscle fibers. Warner-Bratzler shear force was determined using a texture analyzer TA-XT plus (Stable Micro Systems Ltd. Surrey, UK) equipped with a V-shaped Warner-Bratzler device (0.9 mm thick). Samples were shorn at a crosshead speed of 100 mm min^{-1}. Data were collected with Texture Expert Exceed Software (Stable Micro Systems).

Statistical analysis

The data were analyzed by one-way analysis of variance (ANOVA) to test the effect of distance from the wind turbine. Measurements were carried out in at least three repetitions for each of the five loins/necks within each group. The results were presented in tables as mean values and standard error (SE). The significance of differences between means for the investigated parameter within muscle types was determined (at the significance level $P<0.05$) by Tukey's multiple range test.

Results

Noise emission in the audible and infrasound range

The results obtained during the noise measurement are presented in Table 1. The average noise values (both audible noise and infrasound) obtained in pen located 50 m from the wind turbine were the highest of all measured pens. When the distance from the turbine was greater, the intensity of recorded sounds was lower. Measurements of noise emitted by the wind turbine, which is audible for humans (A scale), gave the values in the range of 46.1–53.6. Noise measurements in the infrasound range (G scale) generated by the wind turbine allowed determination of the intensity of sound in the range of 56.2–71.0.

Table 1. The mean values obtained during the noise measurement

Distance from wind turbine (m)	Noise level dB (A)	Noise level dB (G)
50	53.6	71.0
500	52.9	68.5
1000	46.1	56.2

Effect of the distance of the wind turbine on pig meat quality

The results of loin and neck pH measurements for each experimental group are shown in Table 2. In the case of loin muscle, the examination of the pH values indicated no statistically significant differences between growing-finishing pigs reared at varying distances from the wind turbine. Neck muscles of animals reared at the distance of 50 m from the wind turbine were characterized by lower pH values compared to those reared 500 m and 1000 m from the wind turbine.

Table 2. pH, water holding capacity (WHC) and shear force values of meat from growing-finishing pigs reared at three different distances from the wind turbine (mean ± SE)

	pH	WHC (%)	Shear force (N)
Loin			
G-I	5.39±0.06	37.8±4.8	50.6±4.2 b
G-II	5.41±0.04	35.7±6.8	34.8±5.3 a
G-III	5.41±0.05	38.3±9.6	39.7±4.8 a
Neck			
G-I	5.87±0.06 a	20.3±4.4	26.8±5.1
G-II	5.90±0.07 ab	16.6±5.7	28.2±8.2
G-III	6.04±0.06 b	16.0±2.4	27.2±7.8

a, b – different letters in the same column (within each muscle) represent significant differences (P<0.05).

Regarding water holding capacity (WHC) of loin and neck muscles, there was no statistically significant effect of the distance from the wind turbine. Results of shear force measurements revealed that loin muscle of G-I was characterized by higher shear force compared to those of G-II and G-III (Table 2). For the neck muscles, no statistical differences were observed in shear force values across groups.

Table 3 shows results of L*a*b* color coordinate measurements taken for the loin and neck muscles. It was indicated that the close proximity to the wind turbine did not result in significant changes in color coordinate L*. Results obtained for redness were more differentiated. Loins of G-I had significantly lower values of co-ordinate a* than the samples of G-II and G-III. In the case of the neck, no statistical differences were observed in redness values across groups.

The results of total heme pigments and iron content confirmed the results of physical determination of meat color (Table 3). Loins of G-I were characterized the lowest total heme pigments and iron content among all experimental groups.

Table 3. Color coordinates (L*a*b*), total heme pigments and heme iron content of meat from growing-finishing pigs reared at three different distances from the wind turbine (mean±SE)

	Lightness (L*)	Redness (a*)	Yellowness (b*)	Total heme pigments (ppm g^{-1})	Heme iron (ppm g^{-1})
Loin					
G-I	54.1±1.2	–1.0±0.3 a	8.5±0.6	85.9±5.6 a	6.7±0.5 a
G-II	53.5±1.5	1.2±1.0 b	8.2±0.8	119.2±11.2 b	10.5±1.0 b
G-III	56.1±1.7	0.2±0.5 b	8.2±1.1	112.2±18.7 b	10.0±1.7 b
Neck					
G-I	51.4±2.8	5.0±2.2	9.3±1.1	150.8±5.8	13.4±0.5
G-II	49.3±1.0	6.9±0.9	9.9±1.4	160.6±18.2	14.3±1.6
G-III	49.4±1.0	8.8±1.9	10.9±0.8	148.3±9.8	13.1±0.9

a, b – different letters in the same column (within each muscle) represent significant differences (P<0.05).

Effect of the distance from the wind turbine on the fatty acid composition of growing-finishing pig meat

The effect of the distance from the wind turbine on fatty acid composition of growing-finishing pig loin and neck is shown in Table 4.

Table 4. Fatty acid composition (%) of meat from growing-finishing pigs reared at varying distances from the wind turbine

Fatty acid	Loin			Neck		
	G-I	G-II	G-III	G-I	G-II	G-III
C10:0	0.08	0.08	0.08	0.09	0.09	0.08
C12:0	0.10	0.11	0.13	0.14	0.12	0.13
C14:0	1.35	1.45	1.48	1.52 b	1.30 a	1.35 a
C15:0	0.05	0.06	0.09	0.08	0.05	0.07
C16:0	24.32	23.70	23.52	24.51 b	22.89 a	22.79 a
C16:1	3.19	2.79	2.53	3.06	2.07	2.76
C17:0	0.32	0.34	0.57	0.42	0.38	0.44
C17:1	0.31	0.30	0.42	0.38	0.27	0.34
C18:0	13.76	14.33	14.93	13.69 a	17.98 b	13.49 a
C18:1n9c+C18:1n9t	47.24 c	44.28 b	41.21 a	42.63 b	39.89 a	44.03 b
C18:2*n-6*	8.38 a	11.43 b	13.77 c	12.28 a	13.66 b	13.28 b
C18:3*n-3*	0.68 a	0.85 b	1.09 c	0.97	1.04	1.03
C20:0	0.20	0.25	0.22	0.21	0.24	0.18
C20:1	0.00	0.13	0.00	0.00	0.00	0.00
SFA	40.16	40.30	41.01	40.65 b	43.03 c	38.52 a
MUFA	50.73 c	47.48 b	44.16 a	46.06 b	44.22 a	47.12 b
PUFA	9.05 a	12.28 b	14.86 c	13.25 a	14.69 b	14.31 b
n-6	8.38 a	11.43 b	13.77 c	12.28 a	13.66 b	13.28 b
n-3	0.68 a	0.85 b	1.09 c	0.97	1.04	1.03
n-6/n-3	12.32	13.45	12.63	12.66	13.13	12.89
PUFA/SFA	0.22 a	0.30 b	0.36 c	0.32 a	0.34 ab	0.37 b

a, b, c – different letters in the same row (within each muscle) represent significant differences ($P<0.05$).

In three experimental groups of growing-finishing pigs, SFA and MUFA were the predominant components in lipids of loin and neck muscles, whereas the concentration of PUFA was relatively lower. The concentration of C14:0 as well as C16:0 was higher for neck of G-I, but there was no statistical difference for loins. Differences among groups were also found in the concentration of C18:1(n9c+C18:1n9t). With increasing distance from the wind turbine, C18:1(n9c+C18:1n9t) content in loin muscles decreased. The significantly lower content of this fatty acid in neck muscles was observed in the case of growing-finishing pigs from group II. Conversely, the concentration of linoleic acid (C18:2*n-6*) was lower in loin and neck from G-I than from G-II and G-III. The concentration of α-linolenic acid (C18:3*n-3*) in loin and neck muscles decreased as the distance from the place of pig rearing to wind turbine increased.

The content of saturated fatty acids (SFA) in loin muscles was similar for all experimental groups. In the case of neck muscles, SFA was lowest in G-III. Differences among groups were found in the concentration of monounsaturated fatty acids (MUFA). Loins of G-III and neck muscles of G-II had the lowest content of MUFA. The content of polyunsaturated fatty acids (PUFA) was higher for loin and neck muscles of pigs from G-II and G-III than those of G-I. In loin muscles, the content of *n-3* and *n-6* fatty acids was significantly lower for G-I compared to G-II and G-III.

No significant differences were observed for the ratio of *n-6*/*n-3* fatty acids in loin and neck muscles while the effect of the distance from the wind turbine on the ratio of PUFA/MUFA in muscles was noted. When animals were reared in the close proximity to the wind turbine the ratio of PUFA/MUFA was lower in the muscles.

Discussion

Handling at the farm, genetics, the season and preslaughter handling are very important aspects that influence the stress level of the animal and thus are responsible for the development of aberrant meat quality (Van de Perre et al., 2010). While consumers continue to consider sensory and technological quality of meat important issues, they are increasingly concerned with welfare of animals during rearing and at slaughter. Although increasing emphasis has recently been put on ensuring the conditions of animal welfare and stress elimination during the fattening period, only minimal attention has been devoted to examine impact of stress associated with the exposure to noise, in particular generated by wind turbine. Wind turbines generate noise containing infrasound components. On the basis of the results obtained, it can be concluded that the highest level of noise in the audible and infrasound range was recorded 50 m from the wind turbine where growing-finishing pigs of group I (G-I) were reared. When the distance from the turbine increased, the intensity of recorded sounds decreases. Our results are in accordance with those obtained by Pawlas (2009). As reported by Pawlas (2009) the level of noise emitted by wind turbines is in the range of 100 to 107 dB(A) and decreases as the distance from the turbine increases. This has been confirmed also in the studies of Mikołajczak et al. (2013). Their results indicated that when the distance from the wind turbine increased, the intensity of infrasound decreased greatly, and at the distance of 1000 m the intensity was 40 dB. However, the noise values obtained in pens do not exceed the level required by law. According to the Regulation of the Minister of Agriculture and Rural Development dated 15 February 2010, in areas where pigs are kept the noise should not be permanent or induced suddenly, and its intensity should not exceed 85 dB.

On the basis of the results obtained, it can be concluded that rearing pigs in close proximity to a wind turbine (with a capacity of 2 MW) impacts on pH and shear force of muscles. However, the effects observed were dependent on the type of muscle. Neck muscles of pigs reared at the distance of 50 m from the wind turbine were characterized by significantly lower pH values compared to those reared 500 m and 1000 m from the wind turbine while no statistically significant differences between loins were detected. The results are in accordance with our previous research (Karwowska et al., 2014). Noise-induced stress reaction may increase stress hormones that exacerbate the effects of muscular activity on antemortem and postmortem metabolism, consequently affecting rate and extent of glycogen depletion, lactate formation, and pH decline postmortem (Terlouw, 2005). As reported by Aguilera (1994), animals under condition of chronic stress may show rapid postmortem glycolysis, which in turn results in a rapid decline in muscle pH. The previous and current results suggested that the differences in muscle fiber type could result in differences in combating stress and result in alterations in postmortem metabolism between two fiber types affecting the quality of muscles.

The results confirmed no statistical differences in water holding capacity (WHC) between experimental groups. The ability to retain inherent and added water is an important property of meat as it affects both the yield and the quality of the end product. As reported by Andres et al. (2007) water holding capacity is the result of biochemical and physical changes occurring in muscle tissues postmortem and is largely influenced by animal stress, genetics, preslaughter handling conditions and carcass cooling. In contrast, the results of our study did not confirm the effect of noise as a stress factor generated by the wind turbine on the ability to retain inherent and added water by the loin and neck muscles.

L*a*b* color parameters were generally similar across experimental groups, with the exception of differences between a* values for loin muscles. Loins of G-I (50 m from the wind turbine) had significantly lower values of coordinate a* than the samples of G-II and G-III. The results of total heme pigments and iron content confirmed the results of physical determination of meat color. Loins with lower redness were characterized by the lowest total heme pigments and iron content among all experimental groups. Lower contents of heme iron reduce the nutritional value of meat because heme-iron is more available than non-heme iron (Estevez and Cava, 2004).

According to the results of our observations, rearing pigs in close proximity to a wind turbine causes a significant change of fatty acid profile of loin and neck muscles. Fatty acid composition is an important factor in the nutritional quality of muscle and as such has long been a subject of study in meat science receiving considerable attention due to its important role in human health (Raes et al., 2004). Generally, rearing pigs in close proximity to a wind turbine impacts polyunsaturated fatty acids content, in particular C18:3*n-3* fatty acid content of loin muscles. This is in agreement with our previous results (Karwowska et al., 2014) which showed that rearing geese in close proximity to a wind turbine impacts C18:3*n-3* fatty acid content of abdominal fat.

The concentration of α-linolenic acid (C18:3*n-3*) decreased as the distance from the place of growing-finishing pig rearing to wind turbine increased. As is evident from the literature, environmental stress – heat stress in particular – induces the oxidative stress, the term used to describe the condition of oxidative damage as a result of an unfavorable critical balance between free radical generation and antioxidant defenses (Chulayo et al., 2012; Falowo et al., 2014). The condition of oxidative stress results in the degradation of unsaponifiable and polyunsaturated fatty acid fraction of meat lipids and the conversion of oxymyoglobin to oxidized form (metmyoglobin) (Falowo et al., 2014). Thus, the essential α-linolenic acid may be preferentially oxidized, leading to a diminished incorporation into muscles.

In human nutrition, both the content of PUFA and the ratio between *n-6* and *n-3* fatty acids are important (Wood et al., 2008). A high *n-6* PUFA intake can negatively impact human health. The proportion of *n-3* PUFA was significantly lower in the loin muscles of growing-finishing pigs reared 50 m from the wind turbine. However, the *n-6:n-3* PUFA ratio did not differ among the groups. The ratio of *n-6:n-3* PUFA in all the groups was higher than recommended (4:1) (Wood et al., 2008).

In summary, a significant negative influence of noise generated by the wind turbine with a capacity of 2 MW on the quality of growing-finishing pig loin muscles was determined. Rearing growing-finishing pigs in close proximity to the wind turbine resulted in lower pH, total heme pigments and heme iron as well as lower content of C18:3*n-3* fatty acid of loin muscles. In this sense, it is crucial to reduce the exposure of animals to noise generated by wind turbines in order to avoid negative effects on meat quality.

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