

SLAUGHTER VALUE AND MEAT QUALITY IN PIGS FED DIETS WITH DIFFERENT FEED ADDITIVES

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The research aimed at evaluating the slaughter value and meat quality of 32 fatteners fed diets supplemented with an antibiotic growth promoter (control group (C) – 16 animals) or with zinc oxide (experimental group (E) – 16 animals). In a two-stage fattening process, the control fatteners were given an isoenergetic mixture with a 5% addition of a premix containing flavomycin (100 mg/kg pmx), whereas the experimental animals received the antibiotic-free premix. In the I stage of fattening (up to 50 kg of body weight), the diets of the experimental fatteners was supplemented with 0.05% ZnO.

The growth rate and feed utilization in groups C and E were comparable. No statistically significant differences were found in the slaughter traits of the groups examined. The chemical composition of the longest dorsal muscles and the percentage of the lipid fraction of *musculus longissimus* SFA, PUFA and MUFA, were also alike. Compared to the control group, the per cent of SFA was observed to decrease and those of MUFA and PUFA to increase, which was found beneficial. Zinc concentration in meat was within the recommended norms.

The results obtained indicate the possibility of producing good-quality carcass and pork without the addition of an antibiotic growth promoter. No significant differences were obtained between fatteners fed diets supplemented with an antibiotic or zinc oxide as regards fattening results, slaughter value and meat quality.

INTRODUCTION

Importance of consumers' health protection resulted in limited use of feed antibiotics in pig fattening in the Member States of the European Union [Kjeldsen, 2002; Ferket, 2003]. Recently particular attention has been paid to pork quality [Kulisiewicz & Więcek, 2000]. For this reason, one of the key issues is a search for effective feed antibiotic substitutes [Close, 2000; Rekiel, 2002; Mroz & Krasucki, 2002]. One of them can be zinc oxide. The application of zinc oxide reduces clinical and subclinical digestive tract inflammation by stabilizing bacterial flora with selective inhibition of transport processes in bacterial cells and influencing the bacterial respiration chain [Poulsen, 1998; Spears *et al.*, 2000]. Zinc also performs some important functions influencing the metabolism of proteins, fats, and carbohydrates [Poulsen, 1998].

The aim of the present work was to evaluate the slaughter value and meat quality in fatteners fed diets supplemented with antibiotics or zinc oxide (ZnO).

MATERIAL AND METHODS

The studies involved 32 crossbred fatteners produced by mating F₁ sows (Polish Landrace x Polish Large White) to Duroc and Belgian Landrace (BL) boars, at an equal sow-to-boar ratio (Table 1). The animals were divided into two groups with the analogue method. Fatteners of the control group (C) were fed a diet containing 5% of a premix with an

antibiotic growth promoter (Flavomycine – 100 mg/kg pmx), and those of the experimental group (E) – a diet supplemented with this premix and with 0.05% zinc oxide (ZnO) instead of antibiotics at the first stage of fattening.

The animals were kept and fed individually diets containing ground grain (barley and wheat), soybean meal, meat-and-bone meal, lysine and premix. Friable complete diet was supplied twice a day, with free access to water. Isoenergetic mixtures (*ca.* 12.3 MJ ME/kg) containing 160 g and 143 g of total protein at the 1st and the 2nd stage of fattening, respectively, were also introduced. Two-stage fattening was carried out: 1st stage – from *ca.* 21 kg to 55 kg of body weights, 2nd stage – from 55 kg to *ca.* 101 kg of body weights [Polish Swine Nutrition Requirements, 1993].

The sanitary conditions of fattening corresponded with the valid standards [Rokicki & Kolbuszewski, 1996].

After fattening, the animals were slaughtered in compliance with generally accepted procedures. Blood samples were taken to determine serum concentration of zinc. Twenty four hours after slaughter linear measurements and partial dissection of chilled right half-carcasses were performed in accordance with the methodology recommended by the Pig Performance Testing Station [Różycki, 1996]. Samples of the dorsal muscle (*m. longissimum dorsi* - MLD) were taken for chemical analyses, to determine the contents of: dry matter [PN-73/A-82110], crude ash [PN-76/R-64795], total protein with the Kjedahl method [PN-75/A-04018], and crude fat with the Washburn and Nix [1974] method. Zinc concentration in serum and meat samples was deter-

mined in accordance with the procedure recommended by the Department of Physicochemical Analyses, Warsaw Agricultural University. Samples for determinations were prepared by microwave mineralization in a closed system. Flame atomic absorption spectrometry (FAAS) was used for Zn determination. The fatty acid profile was determined by gas chromatography in the lipid fraction of MLD.

The results obtained were subjected to a one-factor analysis of variance with the SPSS 10.0 software.

RESULTS AND DISCUSSION

Fattening of the experimental animals was 3.7 days longer (3.4%) than fattening of the control animals. The differences between the control and experimental groups were not confirmed statistically (Table 1), which should be considered advantageous. Daily body gains and feed conversion were similar in both groups, slightly lower in group E, by 22.2 g (3.0%) and 0.12 kg/kg (4.8%) respectively. These results indicate a similar level of nutrient digestion and assimilation in both groups during fattening. A comparison of the differences in daily body gains between groups C and E at the 1st and the 2nd stage of fattening shows that they were two-fold higher at the 2nd stage of fattening: 16.8 g vs. 33.1 g. Probably the reason for such results was not only the lack of ZnO, but also of antibiotics in diets for older and heavier fatteners.

Spears *et al.* [2000] proved that different zinc compounds (sulfate, bioplex, oxide) are differently absorbed. Zinc application in the form of bioplex is efficient, whereas zinc oxide is more active at the intestinal level and less efficiently absorbed into tissues. Pork is rich in zinc which is a component of many enzymes essential for growth and development, participating in DNA and protein metabolism. Zinc is indispensable for the proper functioning of the immune system and proper bone structure formation. It is also the least toxic of all trace elements [Medical Encyclopedia; Poulsen, 1998].

The results concerning mean backfat thickness (2.23 cm), loin "eye" area (48.8 cm²) and meatiness of primary cuts (61.5%) can be considered satisfactory (Table 1). There were no statistically significant differences in slaughter value between groups C and E, which indicates that good-quality pork can be produced without antibiotic growth promoters. Another argument for feed antibiotic withdrawal from diets for pigs is the so-called "primary effect" of antibiotic growth regulators (AGR), *i.e.* lowered antibiotic effectiveness with animals' age and weight [Rekiel, 2002], and the fact that the positive effect of antibiotic growth promoters has been observed in 72% of cases only [Rosen, 1995].

The statistical analysis did not indicate significant differences between the control and experimental groups as regards meat quality and proportion of fatty acids (SFA, MUFA, PUFA) in the lipid fraction of MLD (Table 2). In group E, the concentration of SFA reduced by 1.38%, and the concentrations of MUFA and PUFA increased by 1.13% and 0.63%, respectively, which is advantageous.

The average zinc content of serum and pork was 1.539 and 16.350 mg/kg, respectively (Table 3). The lower Zn concentration in the serum of the experimental fatteners, compared with the control ones, resulted most likely from ZnO

TABLE 1. Selected fattening results, slaughter value.

Specification	Group		Total	
	C	E	LSM	SE
Number of fatteners (head)	16	16	32	
Fattening results				
Length of fattening (days)	109.2	112.9	111.0	1.57
Age at slaughter (days)	176.8	178.2	177.5	1.98
Daily body gain over the fattening period (g)	735.7	713.5	724.6	8.93
Feed conversion (kg/kg)	2.68	2.80	2.74	0.043
Slaughter value				
Body weight of fatteners at slaughter (kg)	101.5	101.9	101.7	0.57
Weight of cold right half-carcass (kg)	39.0	39.1	39.1	0.30
Weight of primary cuts (kg)	33.8	33.8	33.8	0.25
Dressing yield (%)	76.83	76.78	76.81	0.377
Length of carcass (cm)	77.0	78.2	77.6	0.37
Average backfat thickness, mean of 5 measurements (cm)	2.25	2.20	2.23	0.059
Loin "eye" area (cm ²)	48.5	49.1	48.8	1.78
Loin weight without skin and backfat (kg)	5.19	5.18	5.19	0.100
Ham weight without skin and backfat (kg)	8.07	7.92	8.00	0.104
Meatiness of primary cuts (%)	61.80	61.12	61.46	0.779

C – control group, E – experimental group

TABLE 2. Meat quality.

Specification	Group		Total	
	C	E	LSM	SE
Dry matter (%)	28.11	27.79	27.95	0.284
Total protein (%)	21.89	21.92	21.91	0.174
Crude fat (%)	2.78	2.72	2.75	0.257
Crude ash (%)	1.10	1.14	1.12	0.017
SFA	46.35	44.97	45.66	0.466
MUFA	46.42	47.55	46.99	0.395
PUFA	5.43	6.06	5.75	0.208
Other fatty acids	1.79	1.42	1.61	0.148

C – control group, E – experimental group

TABLE 3. Zinc concentration in tissues.

Specification	Group		Total	
	C	E	LSM	SE
Serum (mg/kg)	1.676	1.404	1.539	0.266
Pork (mg/kg)	15.062 ^A	17.637 ^A	16.350	0.393

A – highly significant difference at $p \leq 0.01$; C – control group, E – experimental group

application only at the first stage of fattening. The studies conducted by Miller *et al.* [1981] showed a linear increase in serum concentration of Zn with an increase in ZnO in diets. The difference in zinc content of meat between the groups examined was statistically significant ($p \leq 0.01$), which may indicate zinc accumulation in muscular tissue. However, the duration of the second stage of fattening without zinc oxide supplementation (8 weeks in group E), seems to be safer taking into account zinc residues in pork. The results of this study correspond with those obtained by Rekiel and

Surdacki [1985]. The Zn content of meat did not exceed 50 mg/kg, considered acceptable [Rutkowska-Pejsak *et al.*, 1998]. It was also found adequate taking into account the role performed by zinc in the organism [Poulsen, 1998].

CONCLUSIONS

The results obtained indicate that good-quality carcass and pork can be produced without antibiotic growth promoters. There were no significant differences between fatteners fed diets supplemented with antibiotics or zinc oxide as regards fattening results, slaughter value and meat quality.

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JAKOŚĆ SUROWCA RZEŹNEGO I MIĘSA WIEPRZOWEGO ŚWIŃ ŻYWIANYCH Z UŻYCIEM RÓŻNYCH DODATKÓW PASZOWYCH

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Oceniono jakość surowca rzeźnego i mięsa wieprzowego 32 tuczników żywionych z dodatkiem antybiotyku paszowego (grupa kontrolna – 16 sztuk) lub tlenku cynku (grupa doświadczalna – 16 sztuk). Tuczniki z grupy K otrzymywały w tuczu dwufazowym izoenergetyczną mieszankę pełnodawkową z 5% dodatkiem premiksu zawierającego flawomycynę (100 mg/kg pmx), a z grupy D premiks bez antybiotyku. W I okresie tuczu (do masy 55 kg) tuczniki D otrzymywały 0,05% dodatek ZnO.

Tempo wzrostu i wykorzystanie paszy w grupach D i K było porównywalne. W cechach rzeźnych nie stwierdzono różnic potwierdzonych statystycznie między grupami. Również skład chemiczny mięśnia najdłuższego grzbietu i udział we frakcji lipidowej *musculus longissimus* SFA, PUFA i MUFA, był podobny. W grupie D w porównaniu z K udział SFA uległ obniżeniu, a MUFA i PUFA podwyższeniu, co jest korzystne. Stwierdzono, że zawartość Zn w mięsie nie przekraczała dopuszczalnych norm.

Uzyskane wyniki wskazują na możliwość produkcji dobrej jakości surowca rzeźnego i mięsa wieprzowego bez dodatku antybiotykowego stymulatora wzrostu. Uzyskano mało zróżnicowane wyniki tuczu, oceny rzeźnej i jakości mięsa tuczników otrzymujących jako dodatek do paszy antybiotyki lub tlenek cynku.