The effect of immunocastration on the meat and fat content of pork carcasses

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Abstract

The carcass evaluation was performed on the carcasses of 60 pigs slaughtered at the age of 166 days. The carcasses were divided into two groups – 30 from surgically castrated pigs (SM) and 30 from immunocastrated (Improvac®) boars (IM). The average carcass weight of the SM group was 86.5 kg, as compared with 84.8 kg for the IM group. The difference was not statistically significant. No differences were determined in the weight of pork cuts (loin, shoulder, leg, neck). A statistically significant difference was, however, found between the SM and IM groups in the thickness and the weight of back fat.

Back fat thickness, carcass, castration, lean meat content, quality class

Introduction

Man has employed the castration of boars in the production of pork meat for centuries. The history of boar castration dates back more than 4 500 years (Chen 2007). The advantage of this procedure is the elimination of boar taint which may be evident in sensory terms in the fat and the meat of uncastrated male pigs (Bonneau 1998; Kameník and Kratochvíl 2012). Castrated boars are not aggressive and are easier to handle on farms during the fattening period. On the other hand, surgical castration presents a problem in animal welfare. Castration is performed on 80 – 100% of boar piglets in the majority of EU countries, the most widespread method being surgical castration without anaesthetic (Blanch et al. 2012). Under the terms of the Brussels Declaration of 2010, EU countries are undertaking voluntarily to end castration in 2018, and from 2012 only castration with an anaesthetic should be accepted. At the present time, there is no EU legislation covering this situation. In Germany, for example, an exception to the law on the protection of animals against cruelty applies for the castration of boar piglets up to the age of 8 days. The German Animal Welfare Association is, however, strongly critical of castration without anaesthetic. It is no surprise, then, that a proposed amendment to the above law requires that all male piglets be surgically castrated only following prior anaesthesia from 2017 onwards (Schulze-Geisthövel and Steinmann 2012).

Male sex hormones have a positive effect in the fattening of boars. This is reflected in male pigs in improved feed conversion, higher daily weight gains, improved health and a higher carcass value. Boars have less body fat than sows (Kouba and Sellier 2011). Gispert et al. (2010) determined a lower proportion of fat in the carcasses of uncastrated boars than in castrated pigs.

Today, immunocastration presents itself as an alternative to surgical castration or the production of young boars (Kratochvíl et al. 2011). The application of Improvac®, a vaccine against the formation of boar taint, has already been approved for use in 55 countries including Japan and the EU (Whittington et al. 2011). Immunological castration represents a method of treating boars that leads to the creation of antibodies to the gonadotropin-releasing hormone in the body and temporarily halts the function of the

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testes. This eliminates the expression of boar taint in the meat and fat tissues (Gispert et al. 2010). Two doses, which must be applied at an interval of at least four weeks, are required for successful use. The second vaccination is prescribed four to six weeks before slaughter. Thanks to higher weight gains in the boars, immunocastrated individuals can be slaughtered slightly earlier than surgically castrated animals (Schulze-Geisthövel and Steinmann 2012). In comparison with surgically castrated animals, the carcasses of immunocastrated boars show a lower proportion of fat and a higher proportion of meat (Fuchs et al. 2009; Gispert et al. 2010).

Application of the Improvac® vaccine has also been used for a number of years in the fattening of pigs in the Czech Republic. The aim of the work presented here was to compare the carcass value of two groups of carcasses (boars following surgical castration and immunocastrated boars) slaughtered at a commercial slaughterhouse.

Materials and Methods

The selection of pigs for slaughter

Sixty pigs of the Danbred breed [(Large White x Landrace) x Duroc] slaughtered at the age of 166 days were included in the experiment. Thirty pigs from this set were surgically castrated by the age of seven days; the vaccine Improvac® (Zoetis Česká republika, s.r.o.) was applied to the second group for the purpose of suppressing the action of the testes (immunocastration). The pigs were fed by the same diet.

Evaluation of the carcass quality

The pigs were slaughtered at a commercial slaughterhouse. An electric current was used to stun the animals. The carcass was weighed after dressing. A Fat-O-Meater (FOM, Carometec, A/S, Herlev, Denmark) was used for the purposes of classification, with the following indicators being expressed: SEUROP grading system, proportion of lean meat in %, thickness of back fat in mm, and thickness of muscle in mm.

All sixty carcasses were cut into sections corresponding to the Czech National Standard 57 6540 (Pork for retail purposes) the day after slaughter. Immediately after the carcasses had been divided, the following parts from each individual were weighed on the bone: neck, loin, shoulder, leg, and belly, and the weight of the back fat (removed from the neck and back area) determined.

Statistical evaluation

The results were subjected to statistical evaluation in the program Statistica CZ 7 (Statsoft Inc., Czech Republic). Average values were calculated along with standard deviations. ANOVA ($P \leq 0.05$, $P \leq 0.01$, $P \leq 0.001$) was used to determine differences between individual parameters.

Results and Discussion

The results for the carcass value of two tested groups of pigs are depicted in Tables 1 – 3. Of the 30 immunocastrated animals, 11 carcasses were classified in conformation class S (average proportion of lean meat 61.0%), and 19 in conformation class E (average proportion of lean meat 58.4%). In contrast, only five of the carcasses of surgically castrated boars were classified in class S (average proportion of lean meat 60.8%). In contrast to pigs to which Improvac® had been applied, there were also conformation class U carcasses

Table 1. Classification of the carcasses of both tested groups of pigs in SEUROP classes

Immunocastrated pigs				Surgically castrated pigs			
Class	Number of carcasses	Carcass weight* (kg)	Proportion of lean meat* (%)	Class	Number of carcasses	Carcass weight* (kg)	Proportion of lean meat* (%)
S	11	83.4	61.0	S	5	87.2	60.8
E	19	85.7	58.4	E	22	86.6	57.9
U	0	–	–	U	3	84.5	54.0

*Average for group

in this group (Table 1). It is clear that immunocastration leads to a higher proportion of muscle in the carcass, although these differences were not statistically significant. The average proportion of lean meat in the group of 30 surgically castrated boars was 58.0% (Table 3) in comparison with 59.0% in the carcasses of immunocastrated individuals (Table 2). Gispert et al. (2010) obtained similar results – the proportion of lean meat they found was 57.3% in the group of castrated pigs in comparison with 57.9% in the carcasses of immunocastrated individuals.

Table 2. Selected indicators of carcass value in immunocastrated individuals (n = 30)

	Proportion of lean meat (%)	Thickness of fat (S) (mm)	Thickness of muscle (M) (mm)	Weight of carcass on receipt (kg)	Neck (kg)	Loin (kg)	Shoulder (kg)	Belly (kg)	Leg (kg)	Fat (kg)
Min – max	50.2 – 61.8	9.0 – 18.0	53.0 – 79.0	69.5 – 96.0	5.3 – 8.0	7.0 – 9.8	9.3 – 12.4	9.4 – 14.4	18.9 – 26.1	1.2 – 2.9
Average ± SD	59.0 ± 2.3	12.4 ± 2.3	66.0 ± 6.6	84.8 ± 7.3	6.6 ± 0.7	8.7 ± 0.8	10.8 ± 0.9	12.3 ± 1.3	22.4 ± 2.0	1.9 ± 0.4
Median	59.3	12.0	66.0	86.8	6.6	8.9	11.0	12.5	22.9	1.8

SD – standard deviation

Table 3. Selected indicators of carcass value in surgically castrated individuals (n = 30)

	Proportion of lean meat (%)	Thickness of fat (S) (mm)	Thickness of muscle (M) (mm)	Weight of carcass on receipt (kg)	Neck (kg)	Loin (kg)	Shoulder (kg)	Belly (kg)	Leg (kg)	Fat (kg)
Min–max	52.5 – 61.3	10.0 – 21.0	50.0 – 80.0	73.4 – 97.3	5.4 – 7.3	6.7 – 10.1	9.5 – 12.8	10.1 – 15.8	19.6 – 26.0	1.5 – 3.2
Average ± SD	58.0 ± 2.0	14.2 ± 2.2	66.1 ± 8.1	86.5 ± 6.9	6.4 ± 0.6	8.7 ± 0.9	10.9 ± 0.9	12.9 ± 1.4	23.2 ± 1.9	2.2 ± 0.4
Median	58.0	14.0	64.5	87.8	6.6	8.6	11.1	13.2	23.2	2.2

SD – standard deviation

The anabolic effect of male sex hormones is expressed not merely in more pronounced muscle development, but also in a lower proportion of fat (Sheridan et al. 1990). Sows show more subcutaneous fat than boars, and castration leads to the greater deposition of fat in the body (Kouba and Sellier 2011). The same results were shown by analyses of two groups of pigs for slaughter in this study. The thickness of back fat and its weight were lower in immunocastrated boars – these differences were statistically significant ($P \leq 0.01$). The reason for this difference is the effect of sex hormones on the metabolism of the boar organism. As has been determined by Zamaratskaia et al. (2008), the level of testosterone in boar blood remains at a level similar to that before vaccination following the first application of Improvac® vaccine; only after the second dose does the concentration of sex hormone fall beneath the detection limit value, which corresponds to the group of boars surgically castrated by the age of one week.

As the values in Tables 2 and 3 show, the average weight and the median of the lean meat, i.e. loin, collar, shoulder and ham, were practically identical. The weight of the belly on the bone was higher in the group of surgically castrated pigs, though this difference was not statistically significant.

Fuchs et al. (2009), too, found

no differences in the weight of the leg (17.2 – 17.3 kg), the loin (6.8 – 6.7 kg) and the shoulder (7.9 – 7.9 kg) after the slaughter of 274 surgically castrated pigs (CM) and 280 immunocastrated individuals (IM). The average weight of the flank was slightly higher in the CM group (14.6 kg as compared with 14.1 kg). Similar results were also determined by Zamaratskaia et al. (2008) during the comparison of three groups of pigs – boars, surgically castrated pigs and immunocastrated individuals. The greatest proportion of lean meat was shown by the group of boars – this difference was statistically significant ($P \leq 0.05$) in comparison with the castrated animals. Nevertheless, the difference between the group of surgically castrated (54.9% average proportion) and immunocastrated pigs (56.1%) was not statistically significant.

Conclusions

The effect of immunocastration (Improvac®) on the thickness and weight of carcass back fat was demonstrated. The carcasses of the group of surgically castrated pigs showed a higher proportion of back fat – the differences between the two groups were statistically significant ($P \leq 0.01$). The proportion of lean meat and the weight of the lean cuts (shoulder, ham, loin and collar) did not, however, show any statistically significant differences. The data recorded agrees with the results published in the specialist literature abroad.

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