

# Carcass and meat quality in surgical castrated boars, boars vaccinated with Improvac<sup>®</sup> and entire boars

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**Abstract**—Vaccination of boars with Improvac<sup>®</sup> is a successful and animal friendly alternative to surgical castration. Objective of the study was to determine if there are differences in carcass and meat quality between surgical castrated boars, boars vaccinated with Improvac<sup>®</sup> and entire boars. In 91 surgical castrated boars, 89 Improvac<sup>®</sup> vaccinated boars and 12 boars carcass weight, lean meat, back fat, boar taint and water binding capacity were measured at slaughtering. PH value, temperature, conductivity and Py value were measured 45 minutes and 24 hours after slaughtering in *M. longissimus* and *M. semimembranosus*. Carcass weight was significantly ( $p < 0.05$ ) higher in vaccinated boars (97.7 kg) than in surgical castrated (94.8 kg) and entire boars (85.9 kg). Lean meat was significantly ( $p < 0.01$ ) higher in vaccinated (56.6%) and entire boars (58.1%) than in surgical castrated boars (54.3%). Boar taint was observed in three of the entire boars (25%). Water binding capacity did not differ between the groups (quotient 0.46). There was also no significant difference in pH value, conductivity, temperature and Py value between the groups. Carcass quality was higher in Improvac<sup>®</sup> vaccinated boars and entire boars than in surgical castrated boars in this study, though the body weight of intact boars was lower. Meat quality parameters, however, did not differ between the groups. This leads to the conclusion that vaccination of boars with Improvac<sup>®</sup> can have a positive effect of carcass quality and is therefore to be recommended as an alternative to prevent boar taint.

**Keywords**—lean meat, back fat, pH value.

## I. INTRODUCTION

In the last decade, due to scientific and public concern regarding surgical castration of male piglets without anaesthesia from an animal welfare point of view, new developments in pig productions have occurred. Vaccination of male pigs with a GnRH analogon (Improvac<sup>®</sup>, Pfizer Animal Health) is a

reliable and animal friendly alternative to surgical castration without anaesthesia. Usually, vaccination is recommended twice with 2<sup>nd</sup> injection given at minimum four weeks after the 1<sup>st</sup> injection and four to six weeks prior to slaughter [1]. Until 2<sup>nd</sup> vaccination male pigs grow as entire boars and therefore show a better growth performance [2]. After 2<sup>nd</sup> vaccination pigs behave like surgical castrated boars [3] and the growth performance is the same, too. Improvac<sup>®</sup> vaccinated male pigs show a higher percentage of lean meat and lower back fat compared to surgical castrated male pigs [2, 4]. There are only few studies with a low number of animals published evaluating the effects of the leaner meat on meat quality parameters [5].

Objective of the study was therefore to investigate both, carcass traits as well as meat quality in surgical castrated male pigs, GnRH vaccinated boars and entire boars with the aim to evaluate if there is a difference in the measured parameters between all three groups. Furthermore was to be proved if there is a correlation between carcass traits and meat quality parameters in Improvac<sup>®</sup> vaccinated boars.

## II. MATERIALS AND METHODS

The study was performed in a commercial pig farm in Saxony Anhalt, Germany. 192 male pigs were included in the study. The animals in group 1 (91 male pigs) were surgical castrated in the first week of live. Group 2 consisted of 89 male pigs which were vaccinated twice with Improvac<sup>®</sup>. 1<sup>st</sup> injection was given in the 10<sup>th</sup> week of live when the animals were moved into the grower-finisher unit. At the age of 21 weeks the pigs of group 2 received the 2<sup>nd</sup> injection. Group 3 contained 12 entire male pigs without treatment. All animals were slaughtered at the age of 25 or 26 weeks.

At slaughtering, carcass weight, lean meat, loin muscle and back fat thickness were measured. Presence of boar taint was evaluated as described in the official statement AVV LmH. For determining the water binding capacity, 2 g of lean muscle were removed from the M. longissimus dorsi 24 hours after slaughtering. Water binding capacity was measured with the “Braunschweiger Gerät” immediately after sample taking. PH value, temperature, conductivity and Py value were measured 45 minutes and 24 hours after slaughtering in M. longissimus and M. semimembranosus.

For statistical analysis, differences between groups were tested with Kruskal Wallis test and Mann Whitney test. Results with  $p < 0.05$  were considered statistically significant. Correlations were proved with correlation coefficient after Pearson.

### III. RESULTS

Results on carcass traits are given in table 1. Carcass weight was significantly ( $p < 0.05$ ) higher in vaccinated boars than in surgical castrated and entire boars. GnRH vaccinated and entire boars had significantly ( $p < 0.01$ ) higher lean meat percentage and lower back fat thickness than surgical castrated male pigs. Loin muscle was significantly ( $p < 0.05$ ) thicker in vaccinated boars than in surgical castrated and entire boars.

Table 1 Carcass traits in 91 surgical castrated male pigs, 89 GnRH vaccinated male pigs and 12 entire boars (mean  $\pm$  standard deviation)

|                   | surgical castrated boars | GnRH vaccinated boars | entire boars       |
|-------------------|--------------------------|-----------------------|--------------------|
| carcass weight kg | 94.8<br>$\pm 8.9$        | 97.7<br>$\pm 7.0$     | 85.9<br>$\pm 12.5$ |
| lean meat %       | 54.3<br>$\pm 3.4$        | 56.6<br>$\pm 2.6$     | 58.1<br>$\pm 1.9$  |
| loin muscle mm    | 57.4<br>$\pm 5.2$        | 59.1<br>$\pm 4.2$     | 55.1<br>$\pm 4.5$  |
| back fat mm       | 18.0<br>$\pm 3.9$        | 15.6<br>$\pm 2.0$     | 12.8<br>$\pm 2.6$  |

Boar taint was observed in three of the entire boars (25%). No boar taint could be observed in the

Improvac<sup>®</sup> vaccinated boars or surgical castrated male pigs.

Meat quality parameters are summarized in table 2. Water binding capacity quotient at 24 hours after slaughtering was 0.46 (mean) in all three groups and did not differ between them. No significant differences were found between the groups regarding pH value, conductivity, temperature and Py neither 45 minutes nor 24 hours after slaughtering.

Table 2 Meat quality parameters in 91 surgical castrated male pigs, 89 GnRH vaccinated male pigs and 12 entire boars 45 minutes and 24 hours after slaughtering (mean  $\pm$  standard deviation)

|                             |            | surgical castrated boars | GnRH vaccinated boars | entire boars       |
|-----------------------------|------------|--------------------------|-----------------------|--------------------|
| pH value 45 min             | M.         | 6.7                      | 6.6                   | 6.5                |
|                             | semim.     | $\pm 0.2$                | $\pm 0.2$             | $\pm 0.3$          |
|                             | M. longis. | 6.5<br>$\pm 0.3$         | 6.6<br>$\pm 0.3$      | 6.6<br>$\pm 0.3$   |
| pH value 24 h               | M.         | 5.7                      | 5.8                   | 5.7                |
|                             | semim.     | $\pm 0.7$                | $\pm 0.3$             | $\pm 0.1$          |
|                             | M. longis. | 5.5<br>$\pm 0.7$         | 5.6<br>$\pm 0.2$      | 5.6<br>$\pm 0.1$   |
| Conductivity (mS/cm) 45 min | M.         | 35.9                     | 38.0                  | 41.7               |
|                             | semim.     | $\pm 11.4$               | $\pm 10.7$            | $\pm 18.3$         |
|                             | M. longis. | 42.4<br>$\pm 15.6$       | 39.4<br>$\pm 17.6$    | 39.0<br>$\pm 20.1$ |
| Conductivity (mS/cm) 24 h   | M.         | 82.6                     | 77.1                  | 84.7               |
|                             | semim.     | $\pm 12.8$               | $\pm 12.7$            | $\pm 4.5$          |
|                             | M. longis. | 91.7<br>$\pm 12.6$       | 89.6<br>$\pm 7.7$     | 91.1<br>$\pm 7.1$  |
| Temperature °C 45 min       | M.         | 40.2                     | 40.0                  | 39.1               |
|                             | semim.     | $\pm 5.0$                | $\pm 0.5$             | $\pm 1.4$          |
|                             | M. longis. | 34.4<br>$\pm 5.0$        | 34.6<br>$\pm 3.0$     | 31.5<br>$\pm 4.5$  |
| Temperature °C 24 h         | M.         | 9.7                      | 9.5                   | 9.0                |
|                             | semim.     | $\pm 1.4$                | $\pm 0.6$             | $\pm 0.7$          |
|                             | M. longis. | 7.7<br>$\pm 1.1$         | 7.7<br>$\pm 0.6$      | 7.5<br>$\pm 0.6$   |
| Py value 45 min             | M.         | 73.3                     | 73.3                  | 74.3               |
|                             | semim.     | $\pm 4.1$                | $\pm 11.1$            | $\pm 1.4$          |
|                             | M. longis. | 66.0<br>$\pm 3.3$        | 67.2<br>$\pm 3.6$     | 66.7<br>$\pm 3.3$  |
| Py value 24 h               | M.         | 68.1                     | 72.2                  | 71.0               |
|                             | semim.     | $\pm 10.2$               | $\pm 4.0$             | $\pm 3.0$          |
|                             | M. longis. | 67.4<br>$\pm 6.8$        | 64.3<br>$\pm 6.3$     | 64.3<br>$\pm 3.1$  |

There was no correlation in none of the groups between carcass traits and meat quality parameters.

pH value correlated in all groups significantly with conductivity 45 minutes ( $r=0.94$ ) as well as 24 hours ( $r=0.90$ ) after slaughtering. An example is given in figure 1. There was a correlation of pH value between *M. semimembranosus* and *M. longissimus*, especially 24 hours after slaughtering ( $r=0.61$ ). Muscle temperature showed a significant correlation with Py value in both muscles, which appeared especially 24 hours after slaughtering ( $r=0.81$ ).

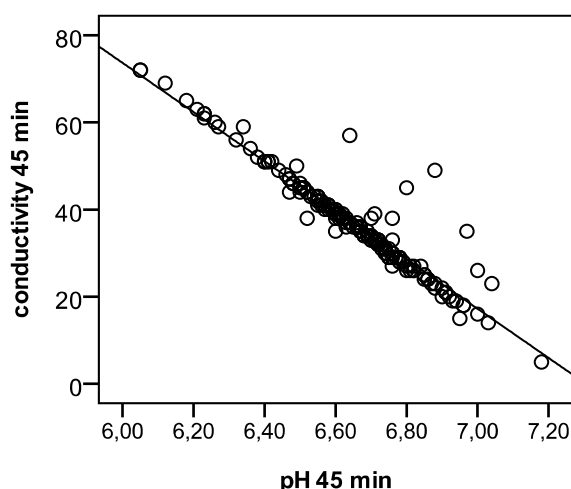


Fig. 1 Scatterplot of pH value and conductivity in *M. semimembranosus* 45 min after slaughtering of surgical castrated, GnRH vaccinated and entire male pigs.

#### IV. DISCUSSION

In this study, the former described [1, 2, 4, 5] better growth performance and carcass quality of Improvac<sup>®</sup> vaccinated boars compared to surgical castrated boars was confirmed. Improvac<sup>®</sup> vaccinated boars had higher carcass weight, leaner meat, thicker loin muscle and lower back fat thickness than surgical castrated boars. Leaner meat and lower back fat was found in entire boars, too. The lower loin muscle thickness in entire boars is obviously due to the lower carcass weight of those animals. Other studies refer about higher carcass weight of entire boars [5].

All measured meat quality parameters, however, did not differ between the groups. The same result was found in another study [5] whereat not quite the same meat quality parameters were measured. No boar taint was observed in the GnRH vaccinated boars. Therefore, no change in meat quality and flavour is to be expected in Improvac<sup>®</sup> vaccinated boars.

#### V. CONCLUSIONS

Vaccination of male pigs with Improvac<sup>®</sup> to prevent boar taint can have a positive influence on carcass traits. No significant changes in meat quality and flavour are to be expected. Improvac<sup>®</sup> vaccination to prevent boar taint is to be recommended as animal friendly and practicable alternative to surgical castration of male piglets.

#### REFERENCES

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