

PE7.37 Impact of using vaccination with Improvac® rather than physical castration on the objective meat quality of finishing male pigs 362.00

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Abstract—The possible effects of using the anti-gonadotrophin releasing factor vaccine, Improvac, rather than physical castration, on the objective meat quality parameters of pH, drip loss, shear force, colour and marbling (intramuscular fat) were examined in a comprehensive database review. Sixteen studies were identified where at least one of these parameters was measured and values compared between vaccinated and physically castrated pigs. Results suggest that, compared to using physical castration, there is no difference in pH (11 studies), drip loss (9 studies) and shear force (8 studies). There may be small effects on colour (lower Minolta L value) but these appear small and inconsistent. Intramuscular fat content is generally reduced in vaccinated pigs when compared to physical castrates, but not to an extent that will impact eating quality.

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Index Terms—meat quality, pH, drip loss, shear force, meat colour, intramuscular fat, Improvac.

I. INTRODUCTION

The anti-gonadotropin-releasing factor vaccine Improvac can be used as an alternative to physical castration to control boar taint. Studies have shown that it is effective in this regard [3, 4, 7]. However, consumer acceptance of pork also depends on characteristics such as appearance, juiciness and tenderness that are associated with physical parameters such as colour, pH, drip loss, shear force and the level of intramuscular fat. These objective meat quality measurements are also important for the meat industry. Several authors [1, 2, 5, 8, 9] have commented on one or more of these aspects, generally finding no significant differences between physically castrated and vaccinated pigs, although Silveira et al [8] found a difference in colour. These reports, however, describe the results of individual

studies. As the physical qualities of meat can be influenced by multiple factors a review of multiple studies will give a clearer indication of the impact, if any, of a specific management change.

II. MATERIALS AND METHODS

A comprehensive review of data relevant to the field use of Improvac was undertaken at the end of 2008. The review included internal study reports belonging to Pfizer Animal Health and external publications. Out of 40 studies 16 were identified that compared loin samples (longissimus dorsi) from physically castrated pigs with vaccinated pigs and included measures of one or more of pH, drip loss, shear force, color or intramuscular fat. In most cases these were secondary measurements in studies primarily designed to investigate the efficacy of Improvac vaccination in boar taint reduction, or the impact of the treatment approach on in vivo growth performance. Although generally similar, the exact procedures used to measure these meat quality parameters showed some differences between studies. In all cases, however, the same measurement procedures were used for both groups within each study. The available data are presented in summary form, together with an indication of any within-study statistically significant differences. No meta-analysis was attempted.

III. RESULTS AND DISCUSSION

The results from each study are summarized in Table 1. pH was measured in 11 studies. No statistically significant differences were found in any study. Within-study numerical differences were small and no overall trend was apparent. Castrated pigs had a slightly higher pH in 6 studies and Improvac vaccinated pigs in 3. In the other two cases the pH values were equal. Drip loss was recorded in 9 studies and there were no within-study significant differences. In 5 studies the numerical figure was higher for castrates and in 4 for vaccinated pigs. Again no trend for one group to be different to the other was apparent. Shear force was measured in 8 studies and in one study the

figure for vaccinated pigs was significantly higher (11.3 lbs/in²) than for castrates (9.9 lbs/in²). Again, however, the overall results suggest no trend, with small, within-trial numerical differences in both directions. Meat colour was assessed in 9 studies using either a Minolta chromameter or US NPCC colour chart methodology. Minolta L values were found to be statistically different in 1 study, with the physical castrates having a higher lightness value. The majority of studies where Minolta L was measured (6/8) also showed a small numerical difference in this direction. This pattern for increased lightness in the physical castrates was *not* observed in the 2 studies that measured colour against the NPCC chart. However, in all cases the differences were small and likely to be irrelevant from a commercial point of view, Intra-muscular fat (marbling) was measured in 7 studies. In all studies the % of intra-muscular fat was slightly higher in physically castrated pigs than vaccinated pigs, with the difference reaching statistical significance on 1 occasion.

IV. CONCLUSION

Despite occasional significant differences ($p < 0.5$) in individual studies, which are to be expected as random events in a large study base, the overall data suggest that the use of vaccination rather than physical castration to control boar taint has no impact on the objective pork quality parameters of pH, drip loss and shear force. There is a suggestion that there might be a small impact on colour, but the differences are inconsistent and small. Intra-muscular fat, however, appears to be consistently lower in vaccinated pigs compared to castrates, although the difference is less than that which would be obtained with entire males and appears to have no impact on consumer perception of pork eating quality [2, 5, 6, 8]. The conclusions are consistent with what might be expected from the mode of action of the vaccine. By creating an immunological response that blocks the activity of gonadotrophin releasing factor, use of Improvac results in temporary suppression of testicular function. Pigs reared using a vaccination regime thus spend most of their fattening period as entire boars but then become physiologically similar to physical castrates in the final few weeks before

slaughter, once they have received a second dose of vaccine. Characteristics such as behaviour and reaction to stress, which can be an important influence on some aspects of meat quality, respond rapidly to the change in hormonal status. Fat levels, however, take longer to adapt and it is known from studies on carcass composition that vaccinated males consistently show lower backfat depth than physically castrated males [7].

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Objective pork quality measurements in Improvac vaccinated (Imp) and physically castrated (Cast) pigs

	Country	No. of pigs Imp / Cast	pH		Intra-muscular fat %		% Drip Loss		Shear Force		Minolta L Colour		US NPPC Colour	
			Imp	Cast	Imp	Cast	Imp	Cast	Imp	Cast	Imp	Cast	Imp	Cast
1	b Japan	21/21	5.5	5.5	2.2	2.8			114	116				
2			55	56					82	99				
3	b Japan	7/11	5.5	5.5	1.8	2.5			131	131				
4			74	56					73	81				
5	Philippines	20/18					2.7	3.1						
6	China	90/90					1.0	0.8						
7	a United States	12/12	5.4	5.4					4.5	4.8	3.8	4.4		
8	Sweden [9]	47/23	5.4	5.5										
9	Australia [2]	20/20	5.6	6.0	2.5	2.7	8.1	8.3			55.3	55.8		
10	Spain	36/24	5.5	5.5			6.0	4.8						
11	c USA	10/10	6.3	6.0	1.1	1.2			11.3	9.9	47.2	47.7		
12			3a	b										
13	b Brazil	20/20	5.6	5.7					4.6	4.9	3.5	2.9	46.5	47.3
14			67	77	4.1	4.2	42.8	44.3						
15	b Brazil [8]	24/22												
16	Thailand [1]	36/36			2.7	2.9	1.6	1.7					2.96	3.00
17	d Thailand	30/29	6.2	6.4					3.0	2.8	8.5	8.2	51.7	51.2
18	Mexico				1.3b	2.3a	3.3	1.6			47.4	48.6		
19	Mexico	45/45	5.8	6.0							44.1	43.7		
20	e Korea (loin) [4]	40/39	5.6	5.6	2.2	2.7			4.4		8	4.3	55.5	55.9
21			62	66									1.95	2.04

a Shear force values in kg/cm²

b Shear force values in gW/cm²

c Shear force values in pounds/square inch on a 2.5 cm cube

d Shear force values in kg/sq cm

e Shear force values in Newton

Means within a country for each parameter with a different superscript letter differs (P<0.05)