PE7.38 Impact of using vaccination with Improvac® rather than physical castration on the carcass characteristics of finishing male pigs 363.00

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Abstract—The effects of using the anti-gonadotrophin releasing factor vaccine, Improvac, rather than physical castration, on fat thickness, loin eye area and the lean meat proportion of pig carcasses were examined in a comprehensive database review. Thirty two studies were identified where at least one of these parameters was measured and values compared between vaccinated and physically castrated pigs. The results suggest that, compared to using physical castration, pigs reared using a vaccination regime are generally consistent in showing lower fat thickness (cross-study mean of -10.2%) and a higher lean meat content (+4.6%). There is also a tendency for loin eye area to be greater in vaccinated pigs.

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Index Terms—carcass composition, lean meat, backfat, loin muscle, Improvac.

I. INTRODUCTION

The anti-gonadotropin-releasing factor vaccine Improvac can be used as an alternative to physical castration to control boar taint. The vaccine works by stimulating the production of antibodies that block the activity of natural gonadotrophin releasing factor, resulting in a temporary suppression of testicular activity. However, the vaccination course is not completed until the second dose is given around 4 to 6 weeks prior to slaughter, meaning that male pigs reared using an Improvac vaccination regime remain fully functional males for the majority of their fattening period. As entire male pigs are metabolically more efficient than castrated pigs this has advantages in on-farm growth performance. There are also benefits in carcass composition [2]. Boars typically have less fat and a greater proportion of lean muscle tissue than physically castrated pigs [1]. These characteristics are generally considered desirable by the meat industry and are largely retained in vaccinated pigs, without the risk of boar taint. Several authors have recorded a reduction in fat and/or an increase in muscle in Improvac vaccinated pigs compared to physically castrated pigs [2, 3, 4, 5]. The published reports, however, all describe the results of individual studies. As carcass composition can be influenced by many other factors, including genetics, nutrition and general management practices, a review of multiple studies is likely to give a clearer indication of the overall impact of changing to an Improvac vaccination regime.

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 32 were identified that compared the carcasses of physically castrated pigs with vaccinated pigs and included measures of one or more of fat thickness, loin eye area, and muscle / lean meat content. 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. In such circumstances the data were usually obtained from commercial abattoirs and were typically based on measurements made using light reflectance equipment (Hennessy Grading Probe, Fat-O-Meater) or ultrasound (AUTO-FOM), followed by the application of standard formulae to produce calculated carcass parameters. In a few studies carcass composition was a primary objective and was assessed using more detailed procedures, including dissection. The available data are presented in summary form, together with an indication of any within-study, statistically significant differences ($p<0.05$). No meta-analysis was attempted.

III. RESULTS AND DISCUSSION

The results from each study are summarized in Table 1. In the 28 studies that reported fat thickness, Improvac vaccinated pigs showed a reduced carcass fat thickness on 22 occasions. In 12 of these 22 studies the difference was statistically significant. It should also be noted that in some of the remainder no statistical analysis was performed. In comparison, in only 4 of the 28 studies did the physical castrates have lower fat thickness than the vaccinated pigs, and this reached statistical significance on only 1 occasion. A simple, unweighted mean of the percentage difference between the two groups showed the average reduction in fat thickness to be 10.2%. The area of the loin eye or depth of the longissimus muscle was reported in 15 studies. While these measures only reached statistical significance on 1 occasion there was a numerical trend for Improvac vaccinated pigs to show larger loin muscle area or depth (10 of the 15 studies). In comparison on only 4 of 15 occasions did the physically castrated pigs show a larger loin area or depth. Across all 15 studies the loin was around 1.7% larger in area in the vaccinated pigs compared to the physical castrates. The percentage of lean meat in the carcass was estimated, by various techniques in 16 studies. Boars vaccinated with Improvac showed a higher lean meat yield in 15 of these 16 studies with 8 of the 15 reaching statistical significance. In comparison the physical castrates showed a slightly (0.6%) higher lean meat yield in only 1 of the 16 studies. When averaged across all 16 studies the Improvac vaccinated pigs had an increase in lean meat as a proportion of the carcass of around 4.6% compared to the physical castrates. In most pork production systems this would represent substantial added value. It should be noted that the figure refers to the calculated percentage increase of one group over the other, not the numerical increase in lean meat, which is often expressed as a % of carcass weight. The overall results are in line with the published literature [2, 3, 4, 5] and confirm that pigs reared with an Improvac vaccination regime have less fat and more lean meat than physically castrated animals. This is a logical consequence of the fact that they spend the majority of the fattening period as entire males, subject to the anabolic action of normal male hormones. Although reasonably consistent in direction, particularly regarding lean meat content, the magnitude of the changes in carcass composition do show variation from study to study. This is not surprising and presumably reflects differences in genetics, nutrition and management, as well as possible differences resulting from experimental design. More detailed analysis would be required to better define these sources of variation.

IV. CONCLUSION

There is a consistent trend, based on multiple studies conducted in different countries and with different systems of pig management, for pigs reared with an Improvac vaccination regime to have less fat and more lean meat than physically castrated pigs. Improvements in carcass composition should, therefore, be routinely considered as a source of economic return for pig producers using a vaccination approach, and for abattoirs processing the carcasses of vaccinated pigs. Although reasonably consistent from a qualitative perspective, the magnitude of the changes in carcass composition does differ from study to study. Further analysis is required to fully identify the sources of variation and suggest ways to optimize the economic return.

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Table 1. Effect of raising boars and using Improvac to control boar taint on carcass characteristics (Imp = Improvac vaccinate; Cast = physical castrate)

	Country [Reference]	No. of pigs	Fat thickness (mm)			Loin Eye Area (cm^2)			% Muscle		
		Imp / Cast	Imp	Cast	% Difference	Imp	Cast	% Difference	Imp	Cast	% Difference
1	[2] China *	20/20	18.3	19.2	-4.7%	46.5	47.4	-1.9%			
2	[2] China *	90/90	20.5[b]	24.0[a]	-14.6%	57.3	57.0	0.5%	57.2[b]	55.9[a]	2.3%
3	[2] Mexico *		22.7[b]	27.0[a]	-15.9%			13.6%	45.46	44.7	1.7%
4	[2] Philippines *	20/18	18.2	17.8	2.2%	45.8	44.5	2.9%			
5	[2] Spain *	36/24	19.7	20.5	-3.9%	53.7	53.1	1.1%			
6	[3] Germany *	110/105	16.2[b]	20.9[a]	-22.5%	62.1	60.5	2.6%			
7	[3] Hungary *	75/63	17.8	21.7	-18.0%	56.9	54.9	3.6%	56.0	53.4	4.9%
8	[3] Mexico *	24/24	15.5[b]	20.1[a]	-22.9%	50.7	48.3	5.0%	52.5[b]	47.9[a]	9.6%
9	[4] Brazil *	20/20	0.81[b]	0.79[a]	2.5%	16.8	17.1	-1.8%	24.39[b 5]	22.82[a]	6.9%
10	[4] Thailand [6]	36/36	0.36[b]	0.45[a]	-20.0%	6.2	6.0	3.3%	58.1[b]	56.8[a]	2.3%
11	[4] USA *	12/12	0.78	0.78	0.0%	7.7	7.7	0.0%			
12	[4] USA *	80/80	0.94[b]	1.01[a]	-6.9%	8.6	8.3	3.6%	62.6 [8]	58.7	6.6%
13	[5] Brazil *	24/22	20.3	19.1	6.3%	47.2	46.2	2.2%	29.1[b 5]	26.6[a]	9.4%
14	Australia [7]	20/20	16.2	15.4	5.2%				640 [9]	644	-0.6%
15	Australia *	60/60	15.3[b]	17.4[a]	-12.1%						
16	Australia *	40/40	11.7[b]	15.6[a]	-25.0%						
17	Australia [2]	50/50	11.9[b]	14.4[a]	-17.4%						
18	Australia [2]	50/50	15.1[b]	17.1[a]	-11.7%						
19	Central America *	122/120	15.8	17.1	-7.6%						
20	Chile *	203/202							50.5	47.7	5.9%
21	Columbia *	120/120	15.0	15.0	0.0%	69.0	70.0	-1.4%			
22	Denmark *	61/63							59.1	58.3	1.4%
23	Italy *	52/54	26.0	26.4	-1.5%						
24	Korea *	85/74	18.0	19.0	-5.3%						
25	Mexico *	265/250	13.8	16.7	-17.4%				54.76	51.25	6.8%
26	Spain *	190/178	16.1[b]	20.2[a]	-20.3%						
27	Sweden [5]	47/23							57.8[b]	54.9[a]	5.3%
28	Switzerland [2]	270/263							54.5[b]	53.8[a]	1.3%
29	Switzerland [8]	13/13	19.3[b]	24.9[a]	-22.5%				55.3[b]	53.2[a]	3.9%
30	Thailand *	77/77	12.6	15.1	-16.6%	39.9	43.1	-7.4%	21.3 [6]	20.0	6.5%
31	Vietnam *	20/20	16.2	18.2	-11.0%						
32	Vietnam *	20/20	17.6	18.6	-5.4%						
	Overall mean				-10.2%			1.7%			4.6%

* Data on file with Pfizer Animal Health, New York, NY

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

[2] Last rib fat

[3] Loin depth

[4] Values in American units - inches, square inches and pounds

[5] Value in kg lean meat per 1/2 carcass

[6] Predicted lean meat yield per carcass (kg)

[7] Half carcass combined weight (kg) of lean meat in the primal cuts - belly, ham, loin & shoulder

[8] Half carcass lean meat in pounds. Calculated on 10 animals per treatment

[9] Lean units in g lean/kg carcass weight