

EM have higher lean growth (i.e., body protein deposition; Pd) capacity and lower feed intake. In EM, energy intake, rather than the animal's Pd capacity, generally determines lean growth. Therefore, energy intake of EM should be maintained high. During the 10-14 day transition period after injecting the booster, IC barrows show a substantial increase in feed intake and body lipid deposition, as well as slight reductions in Pd and maintenance energy requirements, in order to achieve a target body fatness that is reflective of barrows and higher than EM. At slaughter—generally 4 to 6 weeks after injecting the booster—body fatness of IC is intermediate to that of EM and PC barrows, and generally lower than gilts. The effect of restricting energy intake after injecting the booster on body fatness remains to be explored. Given the lack of studies defining nutrient requirements of EM and IC in North America, the factorial approach (modelling) has been used for estimating nutrient requirements, reflecting differences in feed intake, Pd and maintenance energy requirements among genders (e.g., NRC, 2012; Nutrient Requirements of Swine). Based on a recent review of field studies in the US, the difference in Pd between EM and gilts or PC barrows appears higher than estimated in NRC (2012). Based on these analyses, typical nutrient requirements of EM may be underestimated by about 5% in NRC (2012). Timing of administering the booster dose to IC barrows and feeding Paylean™ are means to manipulate pork production efficiencies and carcass fatness of pigs, but their impact on carcass quality and nutrient requirements should be carefully considered.

Key Words: castration, Improvest, pigs

O254 Comparison among gilts, physical castrates, entire males and immunologically castrated males in terms of growth performance and nitrogen metabolism. A. J. Elsbernd*, J. F. Patience, *Animal Science, Iowa State University, Ames.*

The objective of this study was to compare growth performance and nitrogen metabolism of immunological castrates (IC), entire males (EM), physical castrates (PC), and gilts (G). This study used individually housed pigs to evaluate performance from an initial BW of 35.7±4.1 kg to a final weight of 145.0±8.6 kg. Six pigs were selected for each treatment based on pre-test average daily gain for each of the two replicates. Diets were formulated to meet or exceed the nutrient requirements of entire boars and were fed ad libitum. Pigs selected for the IC treatment were vaccinated with a gonadotropin releasing factor (GnRF) analog (Improvest®, Pfizer) at 13 and 18 weeks of age. Urine, feed and fecal samples were collected, homogenized, sub-sampled and analyzed for nitrogen, and feed and feces for dry matter and titanium dioxide, an indigestible marker. Nitrogen intake and excretion were measured during three 72-h collection periods starting at BW of 39.5±4.1 kg, 73.7±5.7 kg and 105.5±6.1 kg for Periods 1, 2, and 3, respectively, with Period 3 occurring two weeks after the 2nd vaccination. EM and IC had a higher ADG compared to PC and G (1.17 and 1.14 kg/d versus 1.06 and 1.05 kg/d, respectively; $P < 0.001$). PC had a significantly higher ADFI than EM and G, with IC being intermediate (PC=3.16 kg/d, IC=3.04 kg/d, EM=2.93 kg/d, and G=2.91 kg/d; $P < 0.03$). EM had the highest gain to feed ratio compared to all the other treatments, while IC were the second highest and G and PC were not significantly different from each other (EM=0.43, IC=0.40, G=0.38, PC=0.36; $P < 0.0001$). In all N-balance periods, nitrogen excretion in the feces was not significantly different among the treatments ($P > 0.10$). In Periods 1 and 2, EM and IC had the lowest urinary nitrogen excretion ($P < 0.0001$). In Period 3, EM had the lowest urinary nitrogen excretion,

while IC were not significantly different from G and PC ($P < 0.0001$). These results suggest that IC have higher nitrogen excretion two weeks after vaccination, which suggests the need for a feeding program similar to PC and G during this time.

Key Words: immunocastration, nitrogen metabolism, pig

O255 Growth responses of immunologically-castrated barrows and gilts to varying intakes of fiber and energy. N. Augspurger^{1,*}, E. Parr¹, A. Schroeder², ¹JBS United, Inc., Sheridan, ²Pfizer Animal Health, Madison.

The objective of this research was to compare the growth and carcass performance of gilts and immunologically-castrated (IC) barrows as affected by dietary intake of fiber and energy. At 6 wk postweaning, 1,720 pigs (PIC 337 × C29 genetics, 26 ± 2 kg) were blocked by sex (gilts and entire males) and body weight to form eight (8) replicates of 27 pigs per sex, according to a randomized complete-block design with a split-plot arrangement of treatments, with sex as the whole plot and dietary treatment the split-plot. Pigs were allowed ad libitum access to common diets prior to the start of the experiment, and then fed experimental diets to market (N = 133 d). The dietary treatments included 1) corn-SBM, 2) 30% DDGS (89% DM, 28% CP, 8% fat, 26% NDF), 3) As 2 + 3% added fat (choice white grease), 4) As 2 + ascending inclusion of fat (1/2/3/4% fat to 59/73/91 kg/mkt). Gilt diets were formulated according to PIC (2011) requirements for SID lysine (g/Mcal ME), and those requirements were adjusted for the IC barrow diets according to Dritz et al. (2011). Immunological castration was carried out in the male pigs via a 2-dose treatment with Improvest®. The 1st injection occurred at an average of 11 wk of age (range 9-13 wk), and the 2nd injection occurred 5 wk prior to market. Pigs were harvested by pen in a commercial processing facility, where carcass weights were obtained and tissue depths (BF and LM) were measured via ultrasound. IC barrows achieved heavier ($P < 0.001$) BW, 7% greater ADG ($P < 0.01$), and 5% greater G/F ($P = 0.05$) compared to gilts. Fat supplementation effected reduced ($P < 0.05$) feed intakes and greater ($P < 0.01$) G/F, with a trend towards lower ($P < 0.10$) G/F in the ascending relative to the constant strategy. There was also a trend towards lower ($P < 0.10$) G/F in the DDGS-supplemented treatments relative to the corn-SBM treatment. DDGS supplementation effected a trend towards greater reductions in carcass weights in IC barrows than gilts (sex × treatment, $P < 0.10$). Similarly, added energy effected a trend towards greater carcass weights in IC barrows (sex × treatment, $P < 0.10$), but similar carcass weights in gilts. This experiment suggests a differential response in carcass growth performance to fiber and energy in IC barrows relative to gilts.

Key Words: energy, fiber, immunological castration

O256 Effects of immunocastration and dried distillers grains with solubles (DDGS) withdrawal on growth performance and carcass characteristics of grow-finish pigs. M. Asmus^{1,*}, A. L. Schroeder², M. A. Tavarez³, M. D. Tokach¹, J. L. Nelssen¹, S. S. Dritz¹, J. M. DeRouchey¹, R. D. Goodband¹, ¹Animal Science and Industry, Kansas State University, Manhattan, ²Pfizer Animal Health, Kalamazoo, ³University of Illinois, Urbana.

A total of 1,360 pigs (24 kg BW) were used in a 125-d study to determine the effects of DDGS withdrawal post-immunocastration (Improvest) on growth performance of grow-finish pigs. Treatments were arranged in a 2 × 3 factorial with the main effects of sex

(physical castrated barrow; PC or immunological castrate; IC) and diet (no DDGS throughout, 30% DDGS throughout, or 30% DDGS through d 75 then withdrawn to no DDGS to d 125). Pens of pigs were randomly allotted by BW and sex to dietary treatments with 8 replicate pens with 27 to 29 pigs per pen. No sex \times diet interactions ($P>0.12$) were observed. For the period before the 2nd Improvest injection (d 0 to 74), boars had lower ($P<0.001$) ADFI, but were more efficient ($P<0.001$) than PC. During this period, pigs fed 30% DDGS had reduced ($P<0.003$) ADG and G:F. After the 2nd Improvest injection (d 74 to 125), IC had increased ($P<0.01$) ADG, ADFI, and G:F. Overall (d 0 to 125), IC had improved ($P<0.003$) ADG and G:F and lower ($P<0.003$) ADFI than PC. The inclusion of 30% DDGS regardless of withdrawal or sex decreased ($P<0.001$) G:F. Carcass yield was lower ($P<0.001$) for IC (74.5%) than PC (76.2%) regardless of diet. Pigs fed 30% DDGS throughout had decreased ($P<0.001$) carcass yield (74.8%) than pigs fed corn-soy diets (75.6%); however, withdrawing DDGS on d 74 was effective at fully recovering the yield loss (75.5%). In summary, IC had reduced carcass yield, regardless of diet type; however, they also had lower ADFI and improved ADG, which resulted in improved F/G.

Gender:	PC	PC	PC	IC	IC	IC	
d 0 to 74:	Corn-soy	DDGS	DDGS	Corn-soy	DDGS	DDGS	SEM
d 74 to 125:	Corn-soy	Corn-soy	DDGS	Corn-soy	Corn-soy	DDGS	
d 0 to 74							
ADG, kg	0.92	0.89	0.89	0.91	0.87	0.88	0.009
ADFI, kg	1.97	1.99	1.94	1.78	1.77	1.78	0.026
G:F	0.47	0.45	0.46	0.51	0.49	0.49	0.005
d 74 to 125							
ADG, kg	0.94	0.95	0.97	1.03	1.05	1.05	0.017
ADFI, kg	3.02	3.11	3.17	3.13	3.23	3.31	0.052
G:F	0.31	0.31	0.31	0.33	0.33	0.32	0.004
d 0 to 125							
ADG, kg	0.92	0.91	0.92	0.95	0.94	0.94	0.009
ADFI, kg	2.35	2.39	2.38	2.27	2.29	2.33	0.031
G:F	0.39	0.38	0.39	0.42	0.41	0.40	0.004

Key Words: DDGS, Improvest, withdrawal

O257 Combined effects of immunological castration and distillers dried grains with solubles (DDGS) on carcass yield of pigs slaughtered at two time points. M. A. Tavárez^{1,*}, A. L. Schroeder², M. D. Asmus³, F. K. McKeith¹, A. C. Dilger¹, ¹Animal Science, University of Illinois, Urbana, ²Pfizer Animal Health, Kalamazoo, MI, ³Animal Science and Industry, Kansas State University, Manhattan.

Male pigs were randomly assigned to sex treatments at birth and allotted to 48 pens (25 pigs/pen) in a grow-finish barn. Physical castrates (PC) were castrated at 5 d of age; immunological castrates (IC) were injected with Improvest at 16 and 20 wk of age. Diets included 0% DDGS fed from weaning to slaughter (control) and 30% DDGS fed from weaning to 2nd injection (step-down) or slaughter (DDGS). Four pigs closest to the median of pen weight were selected; 2 were slaughtered at 5 wk and 2 at 7 wk after 2nd injection. Data were analyzed as a split plot in time using the MIXED procedure of SAS with the main effects sex, diet, time and their interactions with pen as the experimental unit. For BW, IC were heavier than PC at 7 wk (137.93 vs. 132.68 kg; $P<0.01$), but not at 5 wk (119.90 and 117.95 kg; $P=0.85$). At each time point, HCW was similar between PC and IC, but HCW increased more in IC barrows from 5 to 7 wk (15.06 vs 12.35 kg; sex \times time $P<0.01$). Diet had no

effect on BW and HCW ($P>0.19$). Dressing percentage was reduced in IC compared to PC (73.55% vs. 75.21%; $P<0.01$). At each time point, back fat depth (BF) and lean percentage (LP) were similar, but BF increased more (5.99 vs. 3.17 mm) and LP decreased more (3.48 vs. 1.93 percentage units) in IC than in PC from 5 to 7 wk (sex \times time $P<0.01$). Furthermore, at each time point, BF and LP were similar among diets, but BF increased more (6.31 vs. 3.72 mm) and LP decreased more (3.85 vs. 2.14 percentage units) in control compared with the other diets from 5 to 7 wk (diet \times time $P<0.01$). Sex by diet interactions were only significant for bone-in ($P=0.08$) and boneless ($P<0.05$) carcass cutting yields. In each case, carcass cutting yields of control PC were 2-3% less than those of other diets, but all diets were similar in IC. These results suggest PC and IC barrows react to diets containing DDGS in a similar fashion and time after 2nd injection may be of more importance than diet for carcass characteristics.

Key Words: carcass leanness, DDGS, Improvest

O258 Behavior of immunologically-castrated barrows in comparison to gilts, physically-castrated barrows, and intact males. C. L. Puls^{1,*}, A. Rojo¹, M. Ellis¹, D. D. Boler¹, F. K. McKeith¹, J. Killefer¹, P. D. Matzat², A. L. Schroeder², ¹University of Illinois, Urbana, ²Pfizer Animal Health, Kalamazoo, MI.

The behavior of immunologically-castrated (IC) barrows, gilts, physically-castrated (PC) barrows, and intact males was investigated with 160 commercial crossbred pigs using a RCBD (blocking factor date of start on test) with 4 genders: 1) Intact males (IM), 2) IC barrows (with Improvest®), 3) PC barrows, and 4) Gilts (G). Start of test was time of 1st Improvest® dose (16-wk of age; 67.2 \pm 2.50 kg BW) and end of test was 8-wk later. The 2nd dose was given 4-wk after the 1st dose. Pigs were housed in groups of 4 and had ad libitum access to feed and water. Diets were formulated to meet the requirements of IM. Behavior was observed by 2 trained observers over a 12-h period from 0600 to 1800 h on the day before the start of test (day of 1st dose) and end of week 2, 4 (day of 2nd dose), 5, 6, and 8 (end of test) of the study period. General behavior (number of pigs lying, sitting, standing, eating, and drinking) was recorded every 10 min on all pens (10 pens/gender) and aggressive (frequency of head butts, bites, and fights) and sexual (frequency of mounts) behavior was recorded continuously during the 12-h period on a subsample of 16 pens (4 pens/gender). In the first 4-wk of study (prior to 2nd dose), general behavior of IM and IC was similar ($P>0.05$). Also, IM and IC had a greater ($P\leq 0.05$) number of mounts (27.3, 25.5, 1.5, and 2.5 for IM, IC, G, and PC, respectively; SEM 4.37) compared to PC and G. In the last 4-wk of study (after 2nd dose), IM and IC spent more ($P\leq 0.05$) time standing compared to G and PC (10.1, 9.2, 8.5, and 6.7%, respectively; SEM 0.54), and IM spent less ($P\leq 0.05$) time eating (7.1, 10.1, 8.8, and 10.0%, respectively; SEM 0.50) and had a greater frequency of aggressive behaviors compared to the other genders, which were similar in these respects. In the 1st 7 d after 2nd dose, IC and IM behavior was similar ($P>0.05$), but thereafter IC behavior became more similar to PC. These results suggest the behavior of IC was similar to IM in the period from 1st to 2nd Improvest® dose and transitioned to become more similar to the behavior of PC after the 2nd dose.

Key Words: behavior, immunological castration, pigs