Carcass Lipid Iodine Values Taken from Three Carcass Sites are Affected by Dietary Fat Level and Source during the Finishing Period

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Summary and Implications

The inclusion of unsaturated fats in pig diets has raised issues related to pork carcass lipid quality. The objective of this experiment was to develop a more comprehensive understanding of how dietary fat affects the composition of body fat during the finishing period and at market. A total of 42 gilts and 21 barrows (PIC 337 X C22/29) with an average initial weight of 77.8±3.06 kg were allotted based on sex and weight to 7 treatments: 3 and 6% of each of tallow (TAL; iodine value (IV)=41.9), choice white grease (CWG; IV=66.5) or corn oil (CO; IV=123.1), and a control (CNTR) corn-soy based diet with no added fat. Pigs were individually housed to track dietary fat and energy intake. Pigs were weighed and adipose samples were collected from the jowl, belly, and loin on days 0, 18, and 35 and at harvest. Iodine value was determined on diet and carcass lipid samples. Belly weights were recorded at harvest along with a subjective belly firmness score (1-3 with 1 firmest and 3 least firm) 24 h post-mortem. Data were analyzed using PROC MIXED and PROC CORR. Carcass lipid IV was affected by source (TAL=66.8, CWG=70.3, CO=76.3, CNTR=65.4; P<0.0001). Carcass lipid IV for TAL and CWG was not affected by inclusion level; however, CO was affected by level (3%=72.6, 6%=80.0; P<0.0001). Carcass lipid IV was also affected by sex (barrows=69.1, gilts=71.5; P<0.001). The correlation between carcass lipid IV and dietary lipid IV was R2=0.592. Belly weight was increased by inclusion level (CNRT=8.3 kg, 3%=8.8 kg, 6%=9.4 kg; P<=0.02). Belly firmness score was affected by source (CNTR=1.8, TAL=1.7, CWG=2.0, CO=2.2; P<0.05) and sex (barrows=1.6, gilts=2.3; P<0.0001). ADG was increased by inclusion level (CNTR=0.93 kg, 3%=1.04 kg, 6%=1.10 kg; P<0.02). G:F was also improved by inclusion level (CNTR=0.301, 3%=0.337, 6%=0.358; P<0.01). In conclusion, an increase of dietary fat can improve feed efficiency and performance. Dietary fat sources that are highly unsaturated will increase carcass fat IV in a dose dependent manner.

Introduction

The inclusion of certain types of fats in finishing diets can lead to issues related to pork carcass fat quality. Fats that are termed "unsaturated" are those that are soft or even liquid at room temperature cause the greatest concerns. Corn oil or soybean oil are highly unsaturated fats. Tallow is a saturated fat, meaning that it is solid at room temperatures. Choice white grease, which used to be common in pig diets, is intermediate between tallow and corn oil. DDGS contain 8 to 12% corn oil, so feeding DDGS to pigs is the same as feeding corn oil, an unsaturated fat. This issue has brought a measurement known as iodine value (IV) to the forefront of use in the pork industry. The packing industry is looking at adopting this measurement as a standard of quality. However, despite its potential implementation, surprisingly little research has been done on IV. The objective of this experiment was to develop a more comprehensive understanding of how dietary fat affects the composition of body fat during the finishing period and at market.

Materials and Methods

A total of 42 gilts and 21 barrows (PIC 337 X C22/29) with an average initial weight of 77.8±3.06 kg were allotted based on sex and weight to 7 treatments: 3 and 6% of each of tallow (TAL; iodine value (IV)=41.9), choice white grease (CWG; IV=66.5) or corn oil (CO; IV=123.1), and a control (CNTR) corn-soy based diet with no added fat. Pigs were individually housed to track dietary fat and energy intake. Pigs were weighed and adipose samples were collected from the jowl, belly, and loin on days 0, 18, and 35 and at harvest. Iodine value was determined on diet and carcass lipid samples by titration and GC. Belly weights were recorded at harvest along with a subjective belly firmness score (1-3 with 1 firmest and 3 least firm) 24 h post-mortem. Carcass data was recorded under commercial harvesting conditions. Data were analyzed using PROC MIXED and PROC CORR.

Results and Discussion

After analyzing carcass fat samples, it was shown that carcass fat iodine value was affected by the unsaturation in the fat source (P<0.0001). In addition, carcass lipid iodine value for corn oil was affected by inclusion level (P<0.0001). Corn oil at 6% had the highest iodine value at 80. All other treatments were analyzed with an iodine value under 73, which means that they can be used in commercial practices with little risk, since a common standard for carcass fat is an IV value of 74. Additionally, carcass lipid

IV was also affected by sex with barrows at 69.1 and gilts at 71.5 (*P*<0.0001). It was also interesting to find that when looking at the three areas that were sampled from the carcass (jowl, loin, belly), the jowl sample was on average higher in iodine value than its counterparts. The takeaway from this finding is that it's important to know the IV of the fat being fed in the diet, and level at which it is being fed. Because feeding DDGS can help pork producers reduce their cost of production, we want to have the flexibility of feeding as much as we want. However, we also have to provide carcasses to the packers that meet their quality expectations. This research is important because it helps producers determine how much corn oil they can feed while still producing a good quality carcass.

Average daily gain and gain to feed were improved by dietary fat inclusion level, showing, that increasing diet energy intake will increase barn throughput (*P*<0.02).
In conclusion, an increase in dietary fat can improve feed efficiency and performance. However, dietary fat sources that are highly unsaturated will increase carcass fat IV in a dose dependent manner.

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Table 1.1 - Effects of dietary fat on grow/finish swine.

	Treatments						
Item	Control	Tallow		CWG		Corn Oil	
Level	0	3	6	3	6	3	6
Dietary Fat IV[1]	-	41.9		66.5		123.1	
ADG kg	0.93^{b}	1.09^{a}	1.07^{ab}	0.99^{b}	1.11^{a}	1.04^{ab}	1.12^{a}
ADFI kg	3.11	3.26	3.10	2.96	3.12	3.11	3.08
G:F kg	0.301^{d}	0.337^{c}	0.347^{abc}	0.336^{c}	0.360^{ab}	0.339^{bc}	0.367^{a}
Belly Weight kg	8.3^{c}	9.2^{ab}	9.2^{ab}	8.7^{abc}	9.5^{a}	8.6^{bc}	9.5^{a}
Belly Fat IV	63.3^{e}	64.0^{e}	65.9^{de}	67.9^{cd}	69.1^{c}	72.0^{b}	79.1^{a}
Back Fat IV	63.9^{c}	64.3^{c}	66.4^{c}	70.3^{b}	70.0^{b}	70.9^{b}	81.4^{a}
Jowl Fat IV	69.3^{d}	70.9^{cd}	69.6^{d}	72.6^{c}	72.0^{c}	75.6^{b}	79.6^{a}
Carcass Fat IV (Average)	65.4^{d}	66.3^{d}	67.2^{d}	70.2^{c}	70.3^{c}	72.6^{b}	80^{a}

[1] IV = iodine value measured by a direct method
[abc] With in row, means without common a common superscript differ (*P*<0.05)