Equations generated to predict iodine value of pork carcass back, belly, and jowl fat[1,2]

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ABSTRACT: Data from existing literature were used to generate equations to predict finishing pig back, belly, and jowl fat iodine values (IV) and an experiment was conducted to evaluate these equations. The final database included 24, 21, and 29 papers for back, belly, and jowl fat IV, respectively. For experiments that changed dietary fatty acid composition, initial (INT) diets were defined as those fed before the change in diet composition and final (FIN) diets were those fed after. The predictor variables tested were divided into 5 groups: 1) diet fat composition (dietary percent C16:1, C18:1, C18:2, C18:3, EFA, unsaturated fatty acids, and IV product) for both INT and FIN diets, 2) day feeding the INT and FIN diets, 3) ME or NE of the INT and FIN diet, 4) live performance criteria (initial BW, final BW, ADG, ADFI, and G:F), and 5) carcass criteria (HCW and backfat thickness). The PROC MIXED procedure of SAS (SAS Inst., Inc., Cary, NC) was used to develop regression equations. Evaluation of models with significant terms was then conducted based on the Bayesian information criterion. The optimum equations to predict back, belly, and jowl fat IV were backfat IV = 84.83 + (6.87 × INT EFA) – (3.90 × FIN EFA) – (0.12 × INT days) – (1.30 × FIN days) – (0.11 × INT EFA × FIN days) + (0.048 × FIN EFA × INT days) + (0.12 × FIN EFA × FIN days) – (0.0060 × FIN NE) + (0.0005 × FIN NE × FIN days) – (0.26 × backfat depth); belly fat IV = 106.16 + (6.21 × INT EFA) – (1.50 × FIN days) – (0.11 × INT EFA × FIN days) – (0.012 × INT NE) + (0.00069 × INT NE × FIN days) – (0.18 × HCW) – (0.25 × backfat depth); and jowl fat IV = 85.50 + (1.08 × INT EFA) + (0.87 × FIN EFA) – (0.014 × INT days) – (0.050 × FIN days) + (0.038 × INT EFA × INT days) + (0.054 × FIN EFA × FIN days) – (0.0066 × INT NE) + (0.071 × INT BW) – (2.19 × ADFI) – (0.29 × backfat depth). Dietary treatments from the evaluation experiment consisted of a corn–soybean meal control diet with no added fat or a 3 × 3 factorial arrangement with main effects of fat source (4% tallow, 4% soybean oil, or a blend of 2% tallow and 2% soybean oil) and feeding duration (d 0 to 42, 42 to 84, or 0 to 84). The back, belly, and jowl fat IV equations tended to overestimate IV when observed IV were less than approximately 65 g/100 g and underestimate belly fat IV when actual IV are greater than approximately 74 g/100 g or when the fat blend was fed from d 0 to 84 or 42 to 84. Overall, with the exceptions noted, the regression equations were an accurate tool for predicting carcass fat quality based on dietary and pig performance factors.

Key words: iodine value, predictive equations, pork quality

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INTRODUCTION

Over the last decade, the pork industry has placed considerable importance on pork fat quality. Iodine value (**IV**), a measure of fatty acid unsaturation, is one method used by pork processors for assessing pork fat quality. Increases in fatty acid unsaturation or IV are associated with negative impacts on pork fat quality. This can lead to problems with belly slicing efficiency,

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fat smearing, and reduced shelf life because of oxidative rancidity (Wood et al., 2004, 2008).

Currently, several swine packers impose penalties on carcasses that possess carcass fat IV above (more unsaturated) certain thresholds (Benz et al., 2011b). Carcass fat composition of monogastric animals, particularly pigs, is directly related to the fatty acid composition of the diet (Madsen et al., 1992). Therefore, feeding ingredients with high amounts of dietary unsaturated fatty acids will increase carcass fat IV. Examples of these ingredients include dried distiller's grains with solubles (**DDGS**), bakery meal, or added fats such as animal–vegetable blends, choice white grease, or soybean oil (NRC, 2012). With the increased use of these ingredients in swine diets, pork processors are concerned with the associated negative impacts on carcass fat quality, which are correlated with greater carcass fat IV values.

Carcass fat IV varies between the 3 important fat depots (back, belly, and jowl) and their IV show differential responses to the fatty acid composition of dietary feedstuffs (Benz et al., 2010, 2011c). Whereas many studies have been conducted to measure carcass fat IV based on different levels of dietary fatty acid composition, accurately predicting final carcass fat IV of the various fat depots is challenging for producers and processors. Therefore, the objective of this study was to use data from the existing literature to generate predictive equations for back, belly, and jowl fat IV of finishing pigs using dietary characteristics and growth and carcass performance. In addition, an experiment was conducted to evaluate the validity of the equations.

MATERIALS AND METHODS

A literature review was conducted to compile studies that examined the effects of dietary fatty acids and dietary energy on variables associated with growth and carcass characteristics and back, belly, and jowl fat IV. The literature search was conducted via the Kansas State University libraries, using the *Commonwealth Agriculture Bureau International* search engine, and using the keywords "iodine value and pig" or "iodine value and swine." Data were derived from both refereed and nonrefereed publications including theses, technical memos, and university publications. The final database resulted in publication dates from 2002 to 2013.

To be included in the final database, experiments had to meet the following criteria: 1) pigs used in experiments had ad libitum access to feed and water; 2) gender of the pigs was classified as either barrows, gilts, mix gender, or immunocastrate barrows; 3) the percentage of dietary ingredients fed throughout the experiment was adequately defined; 4) the pigs were fed diets without added conjugated linoleic acid (**CLA**); and 5) the experiments provided information including duration of the feeding period, initial BW, final BW, ADG, ADFI, G:F, HCW, and backfat depth. Experiments possessing dietary treatments containing ractopamine HCl were included in the database. The initial screen yielded 46 publications. Papers were eliminated from the analysis because pigs were not allowed ad libitum access to food and water (1 paper), dietary CLA was fed (2 papers and 3 treatments from 1 paper), carcass criteria were not included (4 papers), and growth criteria were not reported (5 papers). The final database resulted in 24 papers with 169 observations for backfat IV, 21 papers with 124 observations for belly fat IV, and 29 papers with 197 observations for jowl fat IV. In all papers, back, belly, or jowl fat IV was determined by either fatty acid analysis (NRC, 2012) or near-infrared analysis (Zamora-Rojas et al., 2013).

The dietary composition of experimental diets was used to calculate percent dietary C16:1, C18:1, C18:2, and C18:3 fatty acids; EFA (sum of C18:2 and C18:3); total unsaturated fatty acids (**USFA**); dietary IV product (**IVP**); and dietary ME (kcal/kg) and NE (kcal/kg) concentrations. Reported individual fatty acid percentages from analyzed ingredients or complete diets were calculated as a percent of total fatty acids. When analyzed values were not reported, fatty acids, as a percentage of total fatty acids, were obtained from Sauvant et al. (2004) or from the USDA-ARS (2010). The fatty acid profile of corn oil from Sauvant et al. (2004) was used for DDGS. Dietary fatty acid concentrations were calculated by multiplying the percent of each fatty acid by the reported analyzed ether extract of the ingredient or diet. If ether extract was not reported, it was derived from the Nutritional Requirements of Swine (NRC, 2012). Iodine value was calculated using the following equation (NRC, 2012): total IV = percent C16:1 (0.9502) + percent C18:1 (0.8598) + percent C18:2 (1.7315) + percent C18:3 (2.6152) + percent C20:4 (3.2008) + percent C20:5 (4.0265) + percent C22:1 (0.7225) + percent C22:5 (3.6974) + percent C22:6 (4.4632). In the equation, percent is the percentage that each fatty acid methyl ester represents of the sum total of all fatty acid methyl esters in the gas chromatographic analysis. The dietary IVP was calculated for all dietary treatments using the following equation (NRC, 2012): IVP = IV of ingredient fat × percent fat in the ingredient × 0.1. The ME and NE content of every diet were determined by using the ingredient ME and NE values provided by the NRC (2012). The ME and NE values for glycerol was obtained from Lammers et al. (2008) and Hinson (2009), respectively.

Some observations (back [n = 36], belly [n = 37], and jowl [n = 45]) changed diet composition during the experiment, resulting in changes in dietary fatty acid composition. Therefore, dietary variables were determined for initial (**INT**) and final (**FIN**) diets. Initial diets are defined as diets fed before the change in ingredient composition and final diets are defined as diets fed after the change in diet composition. Feeding duration of both the INT and FIN diets were used. In the database, observations that did not change dietary fatty acid composition had equal INT and FIN dietary variables and the initial duration was defined as the total duration of the experiment and final duration equaled 0 d. For INT or FIN diets applied over more than one dietary phase, a weighted average of each variable, based on feeding duration within the INT or FIN period, was calculated to describe the treatment applied within that period.

Equation Evaluation Experiment

An experiment was conducted to evaluate the regression equations used to estimate back, belly, and jowl fat IV. Data from this experiment were not included in the data set used to develop the equations. The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment.

A total of 160 finishing pigs (PIC 327 × 1050) with an average initial BW of 45.6 kg were housed at the Kansas State University Swine Teaching and Research Center finishing barn (Manhattan, KS). The finishing barn was an environmentally controlled facility with 1.5-m^2 slatted-floor pens. Each pen was equipped with a dry self-feeder and a nipple waterer to provide ad libitum access to feed and water. Upon placement in the barn, pigs were fed a corn–soybean meal based diet without added fat for 1 wk before the start of the experiment.

Pens of pigs were blocked by sex and BW and allotted to 1 of 10 dietary treatments, with 2 barrows or 2 gilts housed in each pen with a total of 8 pens per treatment. Dietary treatments consisted of a corn–soybean meal control diet with no added fat fed from d 0 to 84 (**CON**), 4% tallow from d 0 to 84 (**T**), 4% tallow from d 0 to 42 and the control diet from d 42 to 84 (**T-CON**), control diet from d 0 to 42 and 4% tallow from d 42 to 84 (**CON-T**), blend of 2% tallow and 2% soybean oil from d 0 to 84 (**BL**), blend of 2% tallow and 2% soybean oil from d 0 to 42 and the control diet from d 42 to 84 (**BL-CON**), control diet from d 0 to 42 and blend of 2% tallow and 2% soybean oil from d 42 to 84 (**CON-BL**), 4% soybean oil from d 0 to 84 (**SBO**), 4% soybean oil from d 0 to 42 and the control diet from d 42 to 84 (**SBO-CON**), and control diet from d 0 to 42 and 4% soybean oil from d 42 to 84 (**CON-SBO**). Soybean oil, tallow, and a blend of the 2 ingredients were added to create treatments of high levels of dietary USFA, high levels of SFA, and a blend of the 2, respectively. A constant standardized ileal digestible lysine:NE ratio was maintained within each phase by increasing soybean meal in the basal diet when adding the fat sources. Dietary treatments were prepared at the Kansas State Animal Science Feed Mill (Manhattan, KS).

Pigs and feeders were weighed approximately every 2 wk to calculate ADG, ADFI, and G:F. Before marketing, pigs were individually tattooed for carcass data collection. On d 84, final pig BW were taken and pigs were transported to Sioux-Preme Packing Co. (Sioux Center, IA) for harvest. Carcass measurements taken at the plant included HCW, loin depth, and backfat thickness.

One pig from every pen was identified and biopsy samples were collected and analyzed for fatty acid composition on d 81. Fatty acid profiles were used to calculate IV as previously described. For sample collection, pigs were first properly restrained using a snare, the hair was clipped in each location (jowl, belly, and loin), and 1 mL of lidocaine was administered to the sample location. After adequate time was given for the biopsy site to be desensitized, an 8-gauge needle was used to pierce the skin and a 10-gauge biopsy needle was used to collect approximately 250 mg of tissue per biopsy site. Fat tissue samples were snap frozen in liquid nitrogen and then stored in a –62° C freezer until analysis.

The long-chain fatty acid profiles were analyzed by mixing 25 mg of dry sample with 2 mL of benzene containing methyl tridecanoate as internal standard (2 mg/mL of benzene, Fluka 91558; Sigma-Aldrich) and 3 mL methanolic HCl before being flushed with nitrogen. Tubes were then capped, vortexed, and heated for 2 h at 70°C with vortexing occurring every 30 min. Tubes were cooled to room temperature, mixed with 5 mL 6% K_2CO_3 and 2 mL benzene, vortexed, and centrifuged at 500 × *g* for 5 min at 21°C. The organic solvent layer was then analyzed by gas chromatography. An Agilent gas chromatograph (model 7890A; Agilent Technologies, Santa Clara, CA) equipped with a HP-88 J&W Agilent GC capillary column (30 m by 0.25 mm by 0.20 μm film) was used for the analysis. The injection temperature was 250°C and the split ratio was 1:100. The flame-ionization detector was set at 280°C and used hydrogen (35 mL/min), air (400 mL/min), makeup helium (25 mL/min), and helium carrier gas at a constant flow (0.91 mL/min). The oven temperature program was set as follows: initial temperature of 80°C, hold for 1 min, increase 14°C/min to 240°C, and hold for 3 min. Supelco 37 Component FAME Mix (47885-U Supelco; Sigma-Aldrich, St. Louis, MO) was used as a standard.

Statistical Analysis

Descriptive statistics of candidate variables were evaluated using the PROC UNIVARIATE procedure of SAS (SAS Inst., Inc., Cary, NC). All candidate variables were then evaluated for correlation using the PROC

CORR procedure of SAS. This was used to determine relationships between variables and prevent multicolinearity. Based on descriptive statistics and correlations, the predictor variables tested were divided into the following groups: 1) diet fat composition (C16:1, C18:1, C18:2, C18:3, EFA, USFA, and IVP), 2) duration of feeding INT and FIN diets, 3) energy content of the diet (ME or NE), 4) performance criteria (initial BW, final BW, ADG, ADFI, and G:F), and 5) carcass criteria (HCW and backfat thickness). The PROC MIXED procedure of SAS was then used to develop regression equations to separately predict back, belly, and jowl fat IV. The method of maximum likelihood was used in the model selection. The treatment applied within each experiment was the experimental unit for modeling of the equations, and experiment within paper was included as a random effect. The error between experiments was partitioned using the repeated statement. Covariance parameter estimates between trials were different. This confirmed using experiment with paper as a random effect. In addition, when experiment within paper was added as a random effect, the Bayesian information criterion (**BIC**) was decreased. This also justified including experiment within paper as a random effect. The statistical significance for inclusion of terms in the models was determined at $P < 0.10$. Further evaluation of models with significant terms was then conducted based on the BIC. A model comparison with a reduction in BIC of more than 2 was considered improved (Kass and Raftery, 1995). In addition, r^2 values were added to describe model comparisons (Neter et al., 1996). Throughout the selection process, studentized residual plots were observed to determine if quadratic terms or interaction terms needed to be tested in the model. The model was determined using a manual forward selection procedure while progressing through the groups of the predictor variables. First, the best single predictor for back, belly, or jowl fat IV was determined. Variables from the dietary fat composition group had the lowest BIC value. Next, the chosen initial and final dietary fat composition variables and the initial and final duration and their interactions were added to the model. Once the best dietary fat composition × duration model was determined, dietary energy content (ME or NE) was added to the model to determine if either were significant and improved the precision of the model. The model was then evaluated for improvement by adding the significant growth performance and carcass criteria parameters.

The method of residual maximum likelihood was then used to obtain the estimate of the parameters for the candidate models. The adequacies of candidate models were also examined by evaluating a histogram of residuals for evidence of normality and plotting residuals against predicted values of y (back, belly, or jowl IV; Kuehl, 2000; St-Pierre, 2003). Actual IV was plotted against predicted IV and was evaluated using the line of equality to determine if there was bias in estimation (Altman and Bland, 1983). Residual plots were also used to investigate outliers. Any residual greater or less than 3 SD from the mean were deemed outliers under review. Outliers were reviewed to determine if they were biologically significant. As a result, 1 observation for back and belly fat IV was removed.

To assess model performance, the observed values from the model evaluation experiment were regressed on the predicted values (Mayer and Butler, 1993). Mean bias, concordance correlation coefficient (**CCC**), bias correction factor (**C_b**), root mean square error for prediction (**RMSEP**), and r^2 were the statistical techniques used to assess the adequacy of the models (Tedeschi, 2006). These statistical procedures were completed using the model evaluation system developed by Tedeschi (2006). Mean bias was used to assess model accuracy and was computed by dividing the mean of the observed value minus the mean of the predicted value by the mean of the predicted values (Cochran and Cox, 1957). The CCC, also known as a reproducibility index, was used to assess both the precision and accuracy of the model (Lin, 1989). The C_b was used to indicate how far the regression line deviated from the slope of unity (45°; Lin, 1989). The RMSEP was used to measure the predictive accuracy of the model (Mitchell, 1997).

RESULTS

The range of values that make up the back, belly, and jowl fat IV databases are presented in Table 1. These values depict the changes in dietary characteristics that were implemented in swine experiments throughout the literature. They also portray the range of growth performance and carcass characteristics throughout experiments used to develop the models herein. When using the equations developed herein, the input variables should reside within these ranges.

Correlations between predictor variables were determined and as expected some of the variables within each category were correlated (data not shown). For variables determining dietary fat composition in all 3 fat depots, IVP was positively correlated ($r > 0.83$, $P < 0.001$) with C18:2, EFA, and USFA for both the INT and FIN diets. The C18:2 was positively correlated ($r = 1.00$, $P < 0.001$) with EFA for the INT and FIN diet in all 3 data sets. The ME content of the diet was positively correlated ($r > 0.86$, $P < 0.001$) with the NE content. For growth and carcass characteristics in all 3 fat depots, FIN BW was positively correlated ($r > 0.64$, $P < 0.001$) with HCW.

Single variable models used to predict back, belly, and jowl fat IV for the dietary fat composition category included the INT and FIN diet IVP, C18:1, C18:2,

Table 1. Descriptive statistics for data included in the evaluation

	Initial period[1]				Final period[2]										
Item	IVP,[3] g/100 g	EFA, %	NE, kcal/kg	Days	IVP,[3] g/100 g	EFA, %	NE, kcal/kg	Days	INT BW,[4] kg	FIN BW,[5] kg	ADG, kg	ADFI, kg	HCW, kg	Backfat depth, mm	Fat IV, g/100 g
Backfat IV[6]															
Mean	60.9	2.48	2,579	69	55.3	2.23	2,582	8	48.2	118.7	0.94	2.63	88.0	20.1	70.5
SD	21.0	0.99	127	27	18.7	0.82	115	17	20.2	16.8	0.08	0.38	13.3	3.8	6.0
Minimum	21.3	0.80	2,262	21	21.3	0.80	2,262	0	21.9	45.5	0.73	1.56	28.1	10.5	58.3
Maximum	107.2	4.88	2,787	125	107.2	4.90	2,787	66	94.3	138.6	1.10	3.64	100.5	29.5	86.1
Belly fat IV[7]															
Mean	57.3	2.33	2,525	76	51.9	2.10	2,548	9	46.1	123.9	0.95	2.61	92.1	20.5	69.3
SD	13.7	0.56	111	27	13.5	0.49	97	17	24.0	6.2	0.07	0.28	4.2	3.8	5.4
Minimum	33.8	1.51	2,262	21	33.8	1.50	2,262	0	21.9	106.0	0.83	2.04	79.5	14.0	58.9
Maximum	96.2	4.09	2,772	125	88.1	3.60	2,772	66	100.6	138.6	1.23	3.31	100.5	29.2	87.3
Jowl fat IV[8]															
Mean	59.1	2.49	2,501	75	54.0	2.25	2,519	7	49.7	124.6	0.94	2.70	91.4	18.9	72.1
SD	16.8	0.75	108	21	16.0	0.65	92	14	18.7	6.6	0.08	0.30	4.5	2.6	4.3
Minimum	22.1	1.08	2,262	21	22.1	1.10	2,262	0	24.0	97.4	0.77	2.03	73.5	10.4	61.4
Maximum	101.1	4.63	2,787	125	101.1	4.60	2,787	66	100.6	138.6	1.23	3.35	100.5	26.0	86.2

[1]Characteristics of initial diets fed during the experiment.

[2]Characteristics of final diets fed during the experiment.

[3]Iodine value product (IVP) = [iodine value of the dietary lipids] × [percentage dietary lipid] × 0.10 and iodine value (IV) = [C16:1] × 0.95 + [C18:1] × 0.86 + [C18:2] × 1.732 + [C18:3] × 2.616 + [C20:1] × 0.785 + [C20:4] × 3.2008 + [C20:5] × 4.0265 + [C22:1] × 0.7225 + [C22:5] × 3.6974 + [C22:6] × 4.4632 (NRC, 2012).

[4]INT = initial. Refers to BW of pigs at the beginning of the experiment.

[5]FIN = final. Refers to BW of pigs at the end of the experiment.

[6]The final database resulted in 24 papers with 169 observations for backfat IV.

[7]The final database resulted in 21 papers with 124 observations for belly fat IV.

[8]The final database resulted in 29 papers with 197 observations for jowl fat IV.

C18:3, EFA, and USFA ($P < 0.01$; Table 2). Also, INT C16:1 ($P < 0.07$) was a predictor of backfat IV. For the dietary energy content category, the INT and FIN ME were predictors of backfat IV ($P < 0.001$). For belly and jowl fat IV, the INT and FIN dietary NE were predictors ($P < 0.01$). Common single variable models used to predict back, belly, and jowl fat IV for the growth and carcass characteristic category included ADG, ADFI, HCW, and backfat depth ($P < 0.05$; Table 3). In addition, FIN BW and G:F were predictors of backfat IV ($P < 0.07$), FIN BW were predictors for belly fat IV ($P < 0.04$), and INT BW were predictors for jowl fat IV ($P < 0.06$). Predictors C18:2 and EFA had the lowest BIC values within the INT and FIN diets.

Using variables from the dietary fat composition and duration of feeding categories, INT EFA, FIN EFA, INT days, FIN days, INT EFA × FIN days, FIN EFA × INT days, and FIN EFA × FIN days had the lowest BIC for all models tested for backfat IV (Table 4). Next, variables from the dietary energy category were tested and the prediction equation was improved by adding FIN NE and FIN NE × FIN days to the model. Lastly, pig growth and carcass characteristics were investigated for inclusion in the model. Adding backfat depth resulted in the best final model. The increase in r^2 values in the multiple variable models compared to the single variable models justifies the use of a multivariable model to estimate backfat IV.

Following the same procedures described above for belly fat IV, INT EFA, FIN days, and INT EFA × FIN days resulted in the lowest BIC. The addition of INT NE and INT NE × FIN days further improved the model, and the addition of HCW and backfat thickness resulted in the best and final model. The increase in r^2 values in the multiple variable models compared to the single variable models also justifies the use of a multivariable model to estimate belly fat IV.

Variables including INT EFA, FIN EFA, INT days, FIN days, INT EFA × INT days, and FIN EFA × FIN days were determined to be components of the best model for jowl fat IV. The variable INT NE was the dietary energy variable that further improved the model. Finally, INT BW, ADFI, and backfat thickness improved the final model. The increase in r^2 values in the multiple variable models compared to the single variable models justifies the use of a multivariable model to estimate jowl fat IV.

For back, belly, and jowl fat IV, the residual plots showed no evidence of any prediction bias (Fig. 1). The residual plots portray the improved precision for the estimation of back and jowl fat IV compared

Table 2. Dietary characteristic single variable models used to predict back, belly, and jowl fat iodine value (IV)

Item	IVP,[1] g/100 g	C16:1, %	C18:1, %	C18:2, %	C18:3, %	EFA, %	USFA,[2] %	ME, kcal/kg	NE, kcal/kg
Initial period[3]									
Backfat IV									
Probability, $P <$	0.001	0.07	0.01	0.001	0.001	0.001	0.001	0.001	0.16
BIC[4]	898	1,041	1,035	871	960	872	942	1,033	1,042
r^2 [5]	0.808	0.529	0.540	0.836	0.711	0.835	0.744	0.540	0.514
Belly fat IV									
Probability, $P <$	0.001	0.29	0.001	0.001	0.001	0.001	0.001	0.34	0.01
BIC	633	716	696	625	696	623	648	716	705
r^2	0.848	0.682	0.739	0.858	0.740	0.937	0.826	0.679	0.725
Jowl fat IV									
Probability, $P <$	0.001	0.92	0.001	0.001	0.001	0.001	0.001	0.83	0.001
BIC[4]	897	1,107	1,065	854	1,067	859	941	1,104	1,079
r^2	0.836	0.452	0.588	0.859	0.573	0.855	0.796	0.451	0.516
Final period[6]									
Backfat IV									
Probability, $P <$	0.001	0.17	0.001	0.001	0.001	0.001	0.001	0.001	0.12
BIC	918	1,042	1,031	887	987	888	951	1,031	1,042
r^2	0.782	0.525	0.558	0.816	0.640	0.813	0.736	0.546	0.513
Belly fat IV									
Probability, $P <$	0.001	0.67	0.001	0.001	0.46	0.001	0.001	0.42	0.001
BIC	644	717	702	629	717	627	659	717	707
r^2	0.841	0.680	0.729	0.856	0.682	0.859	0.819	0.680	0.717
Jowl fat IV									
Probability, $P <$	0.001	0.77	0.001	0.001	0.2	0.001	0.001	0.56	0.01
BIC	992	1,104	1,075	961	1,103	962	1,013	1,104	1,091
r^2	0.707	0.455	0.559	0.726	0.456	0.727	0.682	0.457	0.474

[1]Iodine value product (IVP) = [IV of the dietary lipids] × [percentage dietary lipid] × 0.10) and IV = [C16:1] × 0.95 + [C18:1] × 0.86 + [C18:2] × 1.732 + [C18:3] × 2.616 + [C20:1] × 0.785 + [C20:4] × 3.2008 + [C20:5] × 4.0265 + [C22:1] × 0.7225 + [C22:5] × 3.6974 + [C22:6] × 4.4632 (NRC, 2012).

[2]USFA = unsaturated fatty acids.

[3]Characteristics of initial diets fed during the experiment.

[4]Bayesian information criterion (BIC) values were used to compare the precision of the model. Models that minimized BIC variables within fat depot were used to select variables for initial model building.

[5]Neter et al., 1996.

[6]Final diets fed during the experiment.

to the precision when predicting belly fat IV. When evaluating bias for all 3 fat depots, the final equations tended to overestimate IV when the actual IV were at the lower end of the range (Fig. 2). The final equation for belly fat IV tended to underestimate IV when the actual IV values were at the upper end of the range.

Equation Evaluation Experiment

Regression equation input variables derived from the evaluation experiment are presented in Table 5. Back, belly, and jowl fat IV means determined in the experiment, estimated IV, and evaluation statistics are presented in Table 6. Across all treatments, the mean bias (–2.28 g/100 g) indicated an overprediction by the model for estimation of backfat IV. The CCC value indicated that the model had moderate accuracy and precision. However, the observed C_b indicated that the model achieved moderate to high accuracy. The RMSEP calculation (4.16 g/100 g) indicated that 63.3% of the error associated with the model was random error. Overall, the model was able to explain 67% of the variation (r^2 = 0.67). Estimated backfat IV means generated using the regression equations fell within 3.77 g/100 g of the actual IV for all dietary treatments except C-T, which was 7.47 g/100 g greater than the actual value. When the actual IV values are below approximately 65 g/100 g, the equation will overestimate backfat IV. Therefore, the overestimation of IV for the CON, T, T-C, and C-T diets were expected based on the line of equality and the evaluation statistics. However, the equation tended to overestimate the IV for the C-B and SBO-C treatment by 3.77 and 3.22 g/100 g, respectively, and underestimate the IV for the SBO treatment by 2.5 g/100 g.

Table 3. Pig growth and carcass characteristic single variable models used to predict back, belly, and jowl fat iodine value (IV)

Item	INT BW,[1] kg	FIN BW,[2] kg	ADG, kg	ADFI, kg	G:F	HCW, kg	Backfat depth, mm
Backfat IV							
Probability, $P <$	0.19	0.02	0.05	0.03	0.07	0.02	0.01
BIC[3]	1,043	1,038	1,040	1,040	1,041	1,038	1,037
r^2 [4]	0.517	0.530	0.519	0.538	0.536	0.529	0.535
Belly fat IV							
Probability, $P <$	0.97	0.04	0.01	0.01	0.77	0.001	0.001
BIC	717	713	710	710	717	705	706
r^2	0.679	0.697	0.689	0.686	0.681	0.726	0.699
Jowl fat IV							
Probability, $P <$	0.06	0.15	0.01	0.05	0.76	0.01	0.001
BIC	1,101	1,102	1,098	1,101	1,104	1,095	1,082
r^2	0.443	0.456	0.474	0.470	0.453	0.476	0.518

[1]INT = initial. Refers to BW of pigs at the beginning of the experiment.

[2]FIN = final. Refers to BW of pigs at the end of the experiment.

[3]Bayesian information criterion (BIC) values were used to compare the precision of the model. Models that minimized BIC variables within fat depot were used to select variables for initial model building.

[4]Neter et al., 1996.

Across all treatments, the mean bias (3.19 g/100 g) indicated an underprediction by the model for estimated belly fat IV. The CCC value indicated that the model had moderate accuracy and precision; however, the observed C_b indicated that the model achieved moderate to high accuracy. The RMSEP calculation (4.96 g/100 g) indicated that 56.3% of the error associated with the model was random error. Overall, the model was able to explain 34% of the variation (r^2 = 0.34). Estimated belly fat IV means generated using the regression equations fell within 9.22 g/100 g of the actual IV for all dietary treatments. However, estimated IV for the C, T, T-C, C-T, B-C, and SBO-C treatments were within 3.77 g/100 g of the actual IV. When the observed IV values are less than approximately 65 g/100 g and greater than approximately 70 g/100 g, the equation will over- and underestimate IV, respectively. Therefore, the overestimation of the IV for the BL, C-B, SBO, and C-SBO diets is expected based on the line of equality and evaluation statistics. The equation also underestimated the IV for the T treatment.

Across all treatments, the mean bias (–1.64 g/100 g) indicated an overprediction by the model for estimation of jowl fat IV. The CCC value indicated that the model had moderate to high accuracy and precision. The observed C_b indicated that the model achieved high accuracy. The RMSEP calculation (2.73 g/100 g) indicated that 62.8% of the error associated with the model was random error. Overall, the model was able to explain 72% of the variation (r^2 = 0.72). Estimated jowl fat IV means generated using the regression equations fell within 3.43 g/100 g of the actual IV for all dietary treatments. When the observed IV values are less than approximately 65 g/100 g, the equation will overestimate backfat IV. Therefore, the overestimation of the IV for the CON, T, and C-T diets is expected based on the line of equality and evaluation statistics. However, the equation tended to overestimate the

Table 4. Regression equations generated from existing data for prediction of back, belly, and jowl fat iodine value (IV)

Dependent variable	Models[1]	BIC[2]	r^2 [3]
Backfat IV	= 84.83 + (6.87 × INT EFA, %) – (3.90 × FIN EFA) – (0.12 × INT days) – (1.30 × FIN days) – (0.11 × INT EFA × FIN days) + (0.048 × FIN EFA × INT days) + (0.12 × FIN EFA × FIN days) – (0.0060 × FIN NE) + (0.0005 × FIN NE × FIN days) – (0.26 × BF)	735	0.946
Belly fat IV	= 106.16 + (6.21 × INT EFA) – (1.50 × FIN days) – (0.11 × INT EFA × FIN days) – (0.012 × INT NE) + (0.00069 × INT NE × FIN days) – (0.18 × HCW) – (0.25 × BF)	558	0.937
Jowl fat IV	= 85.50 + (1.08 × INT EFA) + (0.87 × FIN EFA) – (0.014 × INT days) – (0.050 × FIN days) + (0.038 × INT EFA × INT days) + (0.054 × FIN EFA × FIN days) – (0.0066 × INT NE) + (0.071 × INT BW) – (2.19 × ADFI) – (0.29 × BF)	756	0.929

[1]INT = initial; FIN = final; BF = backfat depth, INT EFA and FIN EFA are measured as percents, INT NE and FIN NE are measured in kilocalories per kilogram, BF is measured in millimeters, and INT BW is measured in kilograms.

[2]Bayesian information criterion (BIC) values were used to compare the precision of the model. Models that minimized BIC were preferred candidate models, with a reduction of more than 2 considered improved (Kass and Raftery, 1995).

[3]Neter et al., 1996.

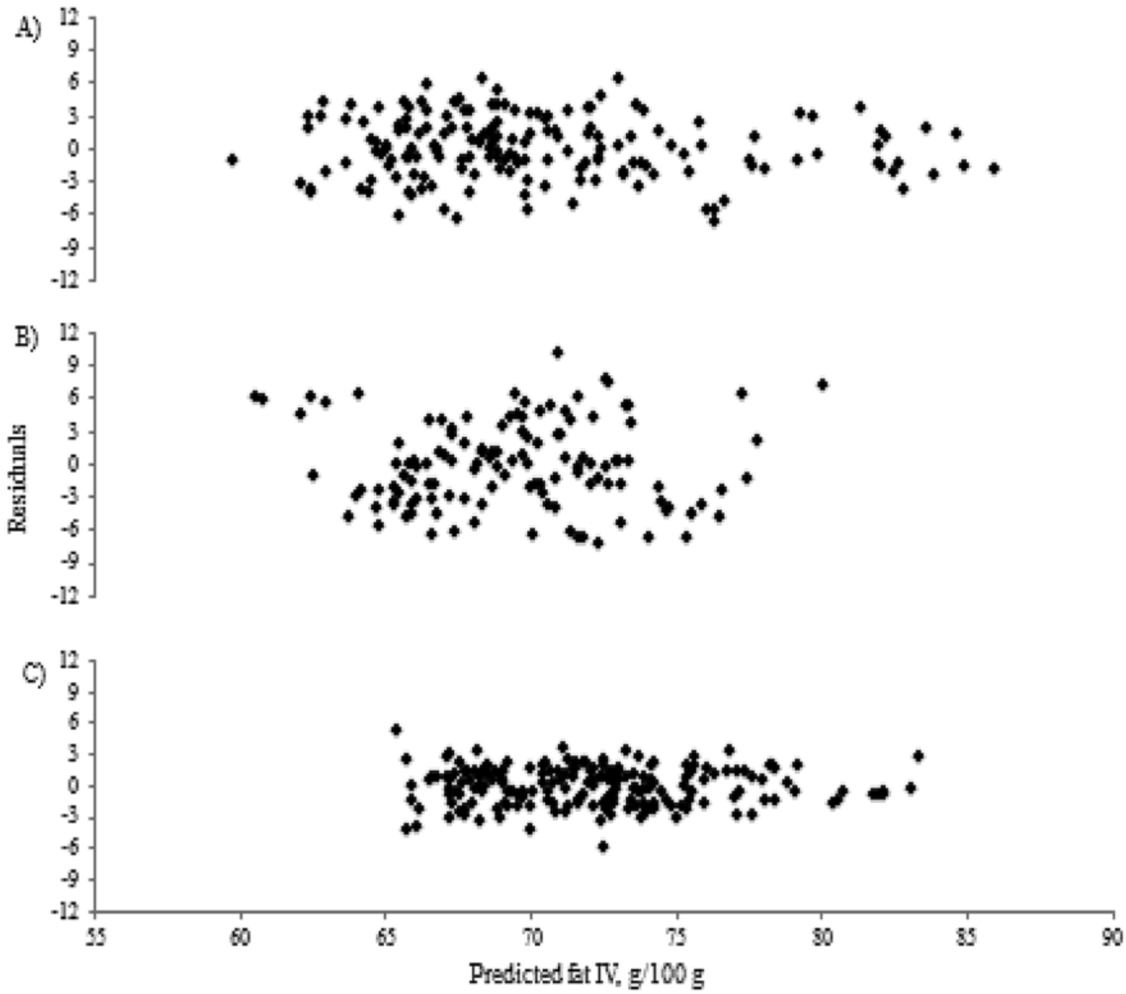

Figure 1. Plot of residuals against predicted A) back, B) belly, and C) jowl fat iodine value (IV) from each mixed model analysis. The following equations were used: A) backfat IV = 81.84 + (7.74 × INT EFA) – (4.33 × FIN EFA) – (0.12 × INT days) – (1.29 × FIN days) – (0.12 × INT EFA × FIN days) + (0.049 × FIN EFA × INT days) + (0.14 × FIN EFA × FIN days) – (0.0051 × FIN NE) + (0.00049 × FIN NE × FIN days) – (0.25 × BF); B) belly fat IV = 106.16 + (6.21 × INT EFA) – (1.50 × FIN days) – (0.11 × INT EFA × FIN days) – (0.012 × INT NE) + (0.00069 × INT NE × FIN days) – (0.18 × HCW) – (0.25 × BF); and C) jowl fat IV = 85.50 + (1.08 × INT EFA) + (0.87 × FIN EFA) – (0.014 × INT days) – (0.050 × FIN days) + (0.038 × INT EFA × INT days) + (0.054 × FIN EFA × FIN days) – (0.0066 × INT NE) + (0.071 × INT BW) – (2.19 × ADFI) – (0.29 × BF) in which INT = initial, FIN = final, BF = backfat depth, INT EFA and FIN EFA are measured as percents, INT NE and FIN NE are measured in kilocalories per kilogram, BF is measured in millimeters, and INT BW is measured in kilograms.

IV for the C-SBO treatment by 2.06 g/100 g. Overall, with the exceptions noted, the regression equations can be used to estimate carcass fat IV based on dietary and pig performance factors.

DISCUSSION

Fatty acid composition of pig adipose tissue is influenced by amounts and proportions of fatty acids in the diet (Wood et al., 2008). The equations developed herein would support this finding based on the variables used by the equations. Dietary fatty acids, dietary IVP, and dietary energy values were calculated using standardized values for ingredients to reduce variability between studies. However, analyzed values were used for these calculations when reported. One assumption made was that the SE were equally weighted across studies, which may be a limitation. The equations generated using single predictors demonstrate that the IV of pork fat is primary influenced by dietary USFA concentration. Regression analyses generated herein determined that dietary EFA was a better predictor for back, belly, and jowl fat IV than IVP. In pork fat, EFA (sum of C18:2 and C18:3) are derived directly from the diet, whereas C16 and C18 SFA and MUFA are mainly the products of de novo synthesis. As a result, the dietary concentrations of EFA have a direct effect on pork fat IV (Wood et al., 2008). Calculated IVP was shown to be correlated with dietary levels of PUFA and MUFA. Therefore, it may be less accurate in predicting pork fat IV because of the association with dietary fatty acids that are not directly deposited. The present model overcame this situation by using only the USFA (EFA) that are directly deposited into the pork fat and, as a result, our model was improved compared to using an IVP-based model. Our findings are in agreement with Benz et al. (2011b),

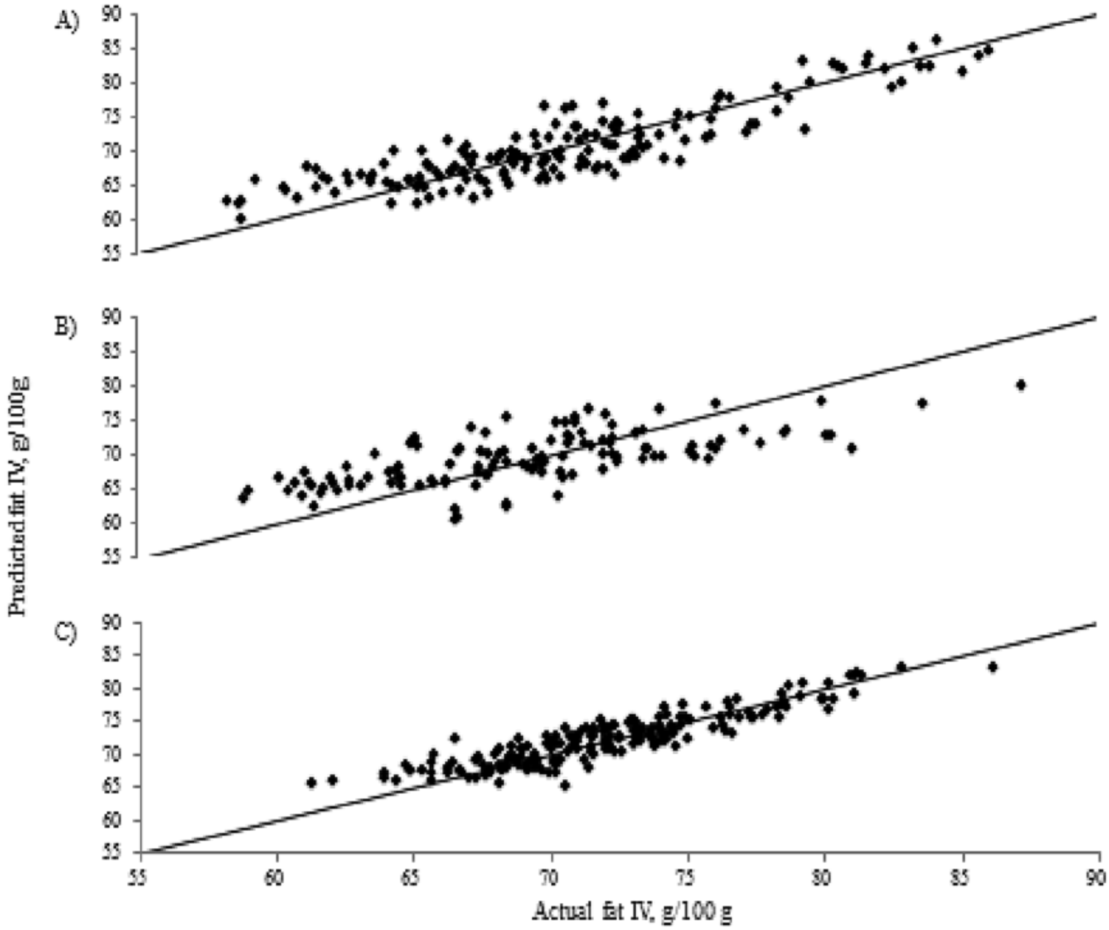

Figure 2. Plot of actual iodine value (IV) vs. predicted IV relative to the line of equality for A) back, B) belly, and C) jowl fat IV from each mixed model analysis. The following equations were used: A) backfat IV = 84.83 + (6.87 × INT EFA) – (3.90 × FIN EFA) – (0.12 × INT days) – (1.30 × FIN days) – (0.11 × INT EFA × FIN days) + (0.048 × FIN EFA × INT days) + (0.12 × FIN EFA × FIN days) – (0.0060 × FIN NE) + (0.0005 × FIN NE × FIN days) – (0.26 × BF); B) belly fat IV = 106.16 + (6.21 × INT EFA) – (1.50 × FIN days) – (0.11 × INT EFA × FIN days) – (0.012 × INT NE) + (0.00069 × INT NE × FIN days) – (0.18 × HCW) – (0.25 × BF); and C) jowl fat IV = 85.50 + (1.08 × INT EFA) + (0.87 × FIN EFA) – (0.014 × INT days) – (0.050 × FIN days) + (0.038 × INT EFA × INT days) + (0.054 × FIN EFA × FIN days) – (0.0066 × INT NE) + (0.071 × INT BW) – (2.19 × ADFI) – (0.29 × BF), in which INT = initial, FIN = final, BF = backfat depth, INT EFA and FIN EFA are measured as percents, INT NE and FIN NE are measured in kilocalories per kilogram, BF is measured in millimeters, and INT BW is measured in kilograms.

who reported that dietary C18:2 is a better predictor of backfat and jowl fat IV than the IVP of the diet.

Some experiments had observations that changed dietary fatty acid composition during the experiment (i.e., switching diets from a high to low or low to high unsaturated fatty acids or IVP). To account for the changes, both INT and FIN dietary EFA were included in the model to predict back and jowl fat IV. Previous research demonstrated the influence of initial dietary EFA on back and jowl fat IV. When increasing the time pigs were initially fed a diet with 2.2% EFA from 26 to 82 d or decreasing the final diet (EFA = 1.6%) from 56 to 0 d, Benz et al. (2011a) reported a 4.0 and 2.7 g/100 g increase in back and jowl fat IV, respectively. Furthermore, in pigs fed a 4.6% INT EFA diet, there was a 16.7 and 8.7 g/100 g increase in back and jowl fat IV, respectively. For pigs fed FIN diets with 2.6 or 1.7% FIN EFA for 47 d immediately before harvest, there was a 2.7 and 7.9 g/100 g decrease in jowl fat IV, respectively. However, when FIN diets with a 2.6 and 1.7% FIN EFA were only fed for the final 23 d, there was only a 1.9 and 2.7 g/100 g decrease in jowl fat IV, respectively. These studies are in agreement with our models used to estimate back and jowl fat IV, which included INT EFA, FIN EFA, INT days, and FIN days as well as the interactions of these variables.

The importance of dietary EFA and duration of feeding on estimating carcass fat IV can further be explained by the mechanisms of adipose tissue deposition and turnover. Pig adipose tissue maintains a certain level of C18:2 derived from the diet, but when extra C18:2 is provided by the diet, the amount in adipose tissue is increased at the expense of other fatty acids (Koch et al., 1968; Warnants et al., 1999). If dietary levels are reduced, adipose tissue fails to accumulate excess levels of C18:2. The theoretical capacity for

Table 5. Inputs from evaluation experiment used in the regression equations to predict back, belly, and jowl fat iodine value[1]

Item	Dietary treatments[2]									
	CON	T	T-CON	CON-T	BL	BL-CON	CON-BL	SBO	SBO-CON	CON-SBO
Initial diet EFA, %	1.50	1.91	1.87	1.47	2.53	2.65	1.47	3.44	3.44	1.47
Initial diet NE, kcal/kg	2,501	2,654	2,654	2,501	2,667	2,667	2,501	2,680	2,680	2,501
Initial diet days	84	84	42	42	84	42	42	84	42	42
Final diet EFA, %	1.50	1.91	1.52	1.94	2.53	1.52	2.41	3.44	1.52	3.45
Final diet NE, kcal/kg	2,536	2,692	2,536	2,692	2,705	2,536	2,705	2,717	2,536	2,717
Final diet days	0	0	42	42	0	42	42	0	42	42
Backfat, mm	17.02	19.30	19.56	18.54	22.35	20.83	19.56	21.84	18.03	19.30
HCW, kg	97.25	99.16	98.52	96.53	96.62	96.57	98.02	98.16	97.75	96.66
ADFI, kg	2.76	2.71	2.79	2.79	2.78	2.70	2.65	2.76	2.71	2.62
Initial BW, kg	45.63	45.68	45.59	45.59	45.86	45.36	45.77	45.59	45.50	45.45

[1]Inputs were obtained from the experiment conducted for evaluation of regression equations.

[2]CON = corn–soybean meal control diet with no added fat fed from d 0 to 84; T = 4% tallow from d 0 to 84; T-CON = 4% tallow from d 0 to 42 and the control from d 42 to 84; CON-T = control from d 0 to 42 and 4% tallow from d 42 to 84; BL = blend of 2% tallow and 2% soybean oil from d 0 to 84; BL-CON = blend of 2% tallow and 2% soybean oil from d 0 to 42 and the control from d 42 to 84; CON-BL = control from d 0 to 42 and blend of 2% tallow and 2% soybean oil from d 42 to 84; SBO = 4% soybean oil from d 0 to 84; SBO-CON = 4% soybean oil from d 0 to 42 and the control from d 42 to 84; CON-SBO = control from d 0 to 42 and 4% soybean oil from d 42 to 84.

changing carcass fat IV is about 60 to 70% within the first 2 wk of dietary change, whereas the full capacity for change is only reached in 6 to 8 wk (Warnants et al., 1999; Xu et al., 2010). However, the elimination rates of C18:2 from backfat are variable and are dependent on the initial C18:2 content in backfat (Camões et al., 1995; Wiseman and Agunbiade, 1998). This would support our model's improvement for predicting carcass fat IV when the diet × duration interaction is also included. The rate of change in jowl fat IV resulting from reducing either the duration of feeding or the level of USFA is less than that of back and belly fat IV. These differences in fat depot specific IV change can be explained by the fact that finishing pigs would likely deposit fat earlier in the jowl before depositing it in the back and belly (Wiegand et al., 2011). Therefore, the fat that is initially deposited in the jowl is less likely to change.

When predicting belly fat IV, INT EFA, FIN days, and INT EFA × FIN days provided the best model. Previous research has demonstrated considerable intrabelly variation in belly fat IV (Trusell et al., 2011). Therefore, we speculate that variation between sites of collection of the belly fat and fewer total observations is the reason the model is not more complex and robust. As a result, the belly fat IV prediction equation is less precise compared to the prediction equations for back and jowl fat IV.

The inclusion of dietary energy content in the final model demonstrated its influence on the IV of pork fat. Bee et al. (2002) previously reported an increase in PUFA and a decrease in SFA and MUFA in carcass backfat inner and outer layers and omental fat of pigs fed low energy diets (2,102 kcal DE/kg) compared to those diets with a greater energy concentration (3,343 kcal DE/kg). This was explained by reductions in the activity of lipogenic enzymes resulting from restricted energy intake. Reductions in the activity of these enzymes represent less de novo fatty acid synthesis, which leads to a greater proportion of USFA being deposited. Bee et al. (2002) investigated the effects of DE on pork fat IV, whereas the current analysis tested ME and NE as predictors of carcass fat IV. In addition, including dietary EFA and NE content improved the precision of the model to predict back, belly, and jowl fat IV more than dietary ME. The models demonstrated the negative correlation between NE and carcass fat IV.

Prediction equations are tools that can become an integral part of a pork enterprise; however, it is essential that they are used correctly to prevent the generation of faulty information. The equations are valid only as long as the input variables consist of values within the ranges used to generate the predictive equation.

Other variables are also known to influence the amount, composition, and quality of pork fat. Wood et al. (2008) described these various factors (such as backfat thickness, gender, age, BW, and maturity) affecting fat composition of pigs. Younger, lighter, and leaner pigs were found to have lower concentrations of C18:0 and C18:1 and greater concentrations of C18:2 in their subcutaneous adipose tissue (Wood et al., 2004; Kloareg et al., 2007; Monziols et al., 2007). The observations collected for the database were from a variety of genetic lines and not distributed evenly across individual genders; therefore, the equations created did not include genetic line or gender. The current analyses support the conclusion that backfat depth accounts for much of the differences observed between carcass fat IV and that backfat depth is negatively correlated with the IV of carcass fat. Other factors that were not included in these analyses because

Table 6. Evaluation of regression equations used to predict back, belly, and jowl fat iodine value (IV)

	Dietary treatment[1]										
Item	CON[1]	T	T-CON	CON-T	BL	BL-CON	CON-BL	SBO	SBO-CON	CON-SBO	Overall
Backfat IV											
Observed,[2] g/100 g	63.29	64.03	63.83	62.72	71.17	66.92	67.83	79.43	67.87	73.86	68.07
Predicted,[3] g/100 g	65.61	66.92	67.16	70.19	70.42	68.59	71.60	76.93	71.09	75.13	70.36
Mean bias,[4] g/100 g	–2.3	–2.97	–3.34	–7.40	0.72	–1.40	–3.48	2.55	–3.88	–1.33	–2.28
CCC[5]	0.17	0.48	0.20	0.07	0.57	0.27	0.26	0.25	0.01	0.10	0.67
C_b[6]	0.41	0.54	0.32	0.08	0.88	0.53	0.42	0.44	0.34	0.47	0.81
RMSEP,[7] g/100 g	4.17	3.18	3.65	7.44	1.80	2.46	4.18	3.84	5.48	2.29	4.16
r^2[8]	0.17	0.78	0.37	0.71	0.41	0.25	0.38	0.32	0.00	0.04	0.67
Belly fat IV											
Observed, g/100 g	66.23	67.25	67.50	66.15	72.42	69.91	70.39	79.45	72.44	74.96	70.60
Predicted,[9] g/100 g	63.70	63.48	68.57	65.95	66.89	70.07	65.43	72.29	72.03	65.74	67.42
Mean bias, g/100 g	1.90	3.71	–1.19	0.19	5.00	0.10	4.84	6.84	0.97	9.21	3.19
CCC	0.19	0.34	0.38	0.63	0.05	0.25	0.14	0.24	0.55	–0.01	0.42
C_b	0.67	0.44	0.76	0.99	0.26	0.99	0.22	0.32	0.90	0.05	0.73
RMSEP, g/100 g	2.89	3.97	1.91	1.54	5.61	2.39	5.13	7.21	2.13	9.43	4.96
r^2	0.08	0.62	0.25	0.40	0.03	0.07	0.39	0.57	0.37	0.14	0.34
Jowl fat IV											
Observed, g/100 g	64.68	65.10	65.43	64.66	69.96	67.56	67.84	75.94	71.07	70.90	68.20
Predicted,[10] g/100 g	67.79	68.32	66.54	68.09	70.42	68.36	69.59	75.23	71.18	72.96	69.84
Mean bias, g/100 g	–3.60	–3.47	–1.23	–3.18	–0.43	–0.87	–2.01	0.73	–0.28	–2.03	–1.64
CCC	0.38	0.45	0.63	0.14	0.53	0.57	0.50	0.54	0.64	0.13	0.75
C_b	0.42	0.55	0.84	0.49	0.87	0.83	0.74	0.92	0.96	0.43	0.88
RMSEP, g/100 g	3.84	3.84	1.87	4.03	1.44	1.95	2.75	1.68	1.70	2.48	2.73
r^2	0.82	0.74	0.57	0.08	0.37	0.38	0.46	0.35	0.44	0.09	0.72

[1]CON = corn–soybean meal control diet with no added fat fed from d 0 to 84; T = 4% tallow from d 0 to 84; T-C = 4% tallow from d 0 to 42 and the control from d 42 to 84; C-T = control from d 0 to 42 and 4% tallow from d 42 to 84; BL = blend of 2% tallow and 2% soybean oil from d 0 to 84; B-C = blend of 2% tallow and 2% soybean oil from d 0 to 42 and the control from d 42 to 84; C-B = control from d 0 to 42 and blend of 2% tallow and 2% soybean oil from d 42 to 84; SBO = 4% soybean oil from d 0 to 84; SBO-C = 4% soybean oil from d 0 to 42 and the control from d 42 to 84; C-SBO = control from d 0 to 42 and 4% soybean oil from d 42 to 84.

[2]Means were obtained from the experiment conducted for evaluation of regression equations.

[3]Backfat IV = 84.83 + (6.87 × INT EFA) – (3.90 × FIN EFA) – (0.12 × INT days) – (1.30 × FIN days) – (0.11 × INT EFA × FIN days) + (0.048 × FIN EFA × INT days) + (0.12 × FIN EFA × FIN days) – (0.0060 × FIN NE) + (0.0005 × FIN NE × FIN days) – (0.26 × BF), in which INT = initial, FIN = final, and BF = backfat depth, INT EFA and FIN EFA are measured as percents, FIN NE is measured in kilocalories per kilogram, and BF is measured in millimeters.

[4]Mean bias was computed by dividing the mean of the observed value minus the mean of the predicted value by the mean of the predicted values (Cochran and Cox, 1957). Mean bias is used to assess model accuracy.

[5]Concordance correlation coefficient (CCC), also known as reproducibility index, assesses both the precision and accuracy of the model (Lin, 1989).

[6]Bias correction factor (C_b) is a component of the CCC statistic that indicates how far the regression line deviates from the slope of unity (45°; Lin, 1989).

[7]Root mean square error of prediction (RMSEP) is used to measure the predictive accuracy of the model (Mitchell, 1997).

[8]Neter et al., 1996.

[9]Belly fat IV = 106.16 + (6.21 × INT EFA) – (1.50 × FIN days) – (0.11 × INT EFA × FIN days) – (0.012 × INT NE) + (0.00069 × INT NE × FIN days) – (0.18 × HCW) – (0.25 × BF), in which INF = initial, FIN = final, and BF = backfat depth, and INT NE is measured in kilocalories per kilogram.

[10]Jowl fat IV = 85.50 + (1.08 × INT EFA) + (0.87 × FIN EFA) – (0.014 × INT days) – (0.050 × FIN days) + (0.038 × INT EFA × INT days) + (0.054 × FIN EFA × FIN days) – (0.0066 × INT NE) + (0.071 × INT BW) – (2.19 × ADFI) – (0.29 × BF), in which INT BW is measured in kilograms.

the data are limited included feeding ractopamine HCL, CLA, and pelleted diets. Previous research observed increased IV when feeding ractopamine HCl to finishing pigs (Carr et al., 2005; Weber et al., 2006; Apple et al., 2008). However, Duttlinger (2013) did not observe differences in back, belly, or jowl fat IV when feeding ractopamine HCl. Previous research has also observed reductions in fat IV from feeding CLA (Weber et al., 2006; White et al., 2009). Lastly, pigs fed pelleted finishing pig diets compared to meal form increases belly fat IV (Nemechek et al., 2013).

Conclusion

There are many factors, both dietary and biological, that affect the fatty acid composition of adipose tissue in pigs. Iodine value is a measure of fatty acid unsaturation and is commonly used for assessing pork fat quality. Equations incorporating the appropriate factors to estimate carcass fat IV will allow producers to feed their pigs appropriately to avoid monetary discounts associated with IV that are greater than acceptable at harvest. A number of different factors were evaluated, but dietary EFA, NE content, and backfat thickness exhibited the greatest influence on predicting IV of 3 distinct fat depots. Regression equations from this paper can be used to predict back, belly, and jowl fat IV.

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