Sensory Characteristics of Loins from Pigs Divergently Selected for Residual Feed Intake and Fed Diets Differing in Energy

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Emily Arkfeld, Graduate Student; Emily Hamman, Undergraduate Student; Jordy Berger, Undergraduate Student, Department of Animal Science, Iowa State University; Roger Johnson, Director of Pork Quality, Farmland Foods, Denison, Iowa; Jennifer Young, Postdoctoral Associate, Department of Animal Science, Iowa State University; Chris Fedler, Assistant Scientist; Ken Prusa, Professor, Food Science and Human Nutrition, Iowa State University; John Patience, Professor; Jack Dekkers, Professor; Nicholas Gabler, Assistant Professor; Steven Lonergan, Professor; Elisabeth Huff-Lonergan, Professor, Department of Animal Science, Iowa State University

Summary and Implications

The goal of this experiment was to determine the impact of high and low energy diets on sensory traits of pigs divergently selected for residual feed intake (RFI). Diet had little effect on sensory quality of loins. Line did have an impact on sensory rated juiciness of loins. Loins from animals of the LRFI line had greater juiciness than those of the HRFI line. This difference is most likely not numerically large enough to be detected by the untrained consumer.

Introduction

It is anticipated that in the future the swine industry will be faced with the challenge of lower energy, higher fiber feedstuffs. Residual feed intake (RFI) is a feed efficiency measure which compares observed feed intake to expected feed intake of an animal. Those animals that consume more than expected, and consequently are less efficient are referred to as high RFI (HRFI). Conversely, animals that are more efficient, consuming less feed than expected are considered low RFI (LRFI). In generation five of the ISU RFI selection no difference was found in sensory traits when the LRFI line was compared to a randomly selected control line. Research from the sixth generation of the Institut National de la Recherche Agronomique (INRA, France) selection project found chops from HRFI animals tended to be juicier than chops from LRFI animals. Our objective was to determine the effects of divergent selection for RFI on sensory of pigs fed either a low energy, high fiber (LEHF) or a high energy, low fiber (HELF) diet.

Materials and Methods

Pigs of the eighth and ninth generation of the ISU RFI selection project were used [n=155 LRFI (82 HELF, 73 LEHF), n=153 HRFI (79 HELF, 74 LEHF)]. LRFI animals have been selected since generation one, and divergent selection for a HRFI line was initiated generation five. For each generation six pens were placed on the HELF diet (3.32 Mcal/Kg ME; 9.5% NDF) and six pens on the LEHF diet (2.87 Mcal/Kg ME; 24.6% NDF). Pigs were put on-test at 89.2 ± 3.9 days (35.9 ± 4.8 kg) and 107.2 ± 8.3 days (42.6 ± 7.0 kg) for generations eight and nine, respectively. Pigs were slaughtered in a commercial slaughter facility. In generation eight harvests occurred in three groups over an eight week period (February – April) and generation nine occurred in two groups over at five week period (June – July). Mean off-test ages were 239.5 ± 19.8 days (122.2 ± 7.7 kg) and 227.0 ± 14.5 days (128.4 ± 8.0 kg) for generations eight and nine, respectively. Pigs were rendered insensible by the use of carbon dioxide stunning, and carcasses were chilled using a spray-chill scenario. Loins were removed 24 hours postmortem, de-boned, trimmed, and vacuum packaged. Loins were cut into 2.54 cm chops for analyses at the ISU Meat Laboratory 48 hours after harvest. In order to minimize location effects chops were cut in the same order every time. Sensory and star probe samples were sealed in vacuum package bags and held at 0° C for seven days postmortem until freezing at -20° C. Chops were then thawed at 4° C for 48 h, and cooked on clamshell grills to an internal temperature of 68° C. Individual chop temperatures were monitored using thermocouples attached to a digital temperature monitor (Omega Engineering Inc., Stamford, CT). Sensory evaluation was conducted on two chops per loin. Cubes were cut from the center of each chop. A trained sensory panel (n=8) evaluated samples for juiciness, tenderness, chewiness, pork flavor, and off-flavor. A 15 unit unanchored scale was used with terms which represented a low degree of each trait on the left end of the line and a high amount of each traits on the right end. Sensory data was collected using a computerized sensory software system (Compusense five, release 5.4, Compusense, Inc., Guelph, Ontario, Canada). Chops for star probe value determination were cooked using the same methods as sensory evaluation; however after cooking they were allowed to cool to room temperature. One chop from each animal was punctured 3 times.

Data were analyzed using the MIXED procedure in SAS (v. 9.3, SAS Institute Inc., Cary, NC). The model included fixed effects of line, diet, sex, generation, line*diet, significant interactions of line*sex, sex*diet, and line*sex*diet were tested and left in the model if P≤0.10; random effects of slaughter group, pen, litter, sire, and sensory day; and a covariate of off-test live weight.

Results and Discussion

Results are reported in table 1. LRFI pigs had loin samples which were rated as more juicy than loin samples

from HRFI pigs (P<0.05) by a trained sensory panel. This differs from the sixth generation of INRA divergent selection, which reported a tendency for LRFI animals to have chops with decreased juiciness. No other line or diet differences were observed for sensory traits. Barrows had loins which were rated as more tender (P<0.05) than loins from gilts by the sensory panelists. Additionally chops from barrows were found to have lower star probe values (P<0.05) than chops from gilts. In conclusion line and diet had minimal effects on sensory characteristics.

Table 1. Effect of selection of divergent residual feed intake (RFI), diets differing in fiber and energy content and sex on sensory, star probe, and desmin degradation values.

Trait	LRFI	HRFI	P-value	HELF	LEHF	P-value	Barrow	Gilt	P-value
Juiciness	9.80[1] (0.16)[2]	9.34 (0.16)	**<0.05**	9.60 (0.16)	9.54 (0.16)	0.76	9.52 (0.15)	9.62 (0.15)	0.59
Tenderness	9.11 (8.58, 9.65)[3]	9.18 (8.64, 9.74)	0.84	9.17 (8.72, 9.64)	9.12 (8.65, 9.60)	0.84	9.40 (8.94, 9.88)	8.89 (8.44, 9.35)	**<0.05**
Chewiness	4.91 (4.39, 5.49)	4.89 (4.36, 5.48)	0.95	4.98 (4.53, 5.48)	4.82 (4.37, 5.32)	0.53	4.75 (4.32, 5.22)	5.06 (4.60, 5.56)	0.21
Pork flavor	4.34 (0.12)	4.47 (0.12)	0.26	4.38 (0.12)	4.43 (0.12)	0.71	4.41 (0.12)	4.40 (0.12)	0.97
Off flavor	0.39 (0.29, 0.50)	0.34 (0.25, 0.44)	0.42	0.42 (0.32, 0.53)	0.31 (0.22, 0.42)	*0.08*	0.39 (0.30, 0.50)	0.34 (0.25, 0.43)	0.24
Star probe, Kg	4.75 (4.56, 4.95)	4.73 (4.55, 4.93)	0.87	4.74 (4.56, 4.93)	4.75 (4.55, 4.96)	0.95	4.66 (4.49, 4.84)	4.83 (4.64, 5.02)	**<0.05**

[1] Least square means shown for each trait.
[2] (SE) shown for each trait
[3] *(95% confidence interval)* shown for each trait. Confidence intervals are presented for data which had to be transformed to achieve a normal distribution for statistical analysis.