# EFFECTS OF GLYCEROL AND RACTOPAMINE HCL (PAYLEAN) ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, AND LOIN QUALITY OF FINISHING PIGS[1,2]

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## Summary

A total of 1,054 barrows and gilts (PIC, initially 207.8 lb) were used in a 28-d study to determine the influence of glycerol and ractopamine HCl (Paylean) on growing-finishing pig performance, carcass characteristics, and loin quality. The experiment was conducted in a commercial swine research facility in southwest Minnesota. Pigs were blocked by weight and randomly allotted to 1 of 4 dietary treatments with 10 replications per treatment. Pigs were fed corn-soybean meal-based diets. Dietary treatments were arranged in a 2 × 2 factorial with main effects of glycerol (0 or 5%) and ractopamine HCl (0 or 6.75 g/ton). Overall (d 0 to 28), there were no glycerol × ractopamine HCl interactions ($P > 0.10$) observed for growth performance. Pigs fed dietary glycerol had improved ($P < 0.04$) F/G, but ADG and ADFI ($P > 0.40$) were not affected. Pigs fed diets with added ractopamine HCl had improved ($P < 0.01$) ADG and F/G with a tendency ($P > 0.08$) for lower ADFI than pigs fed diets with no ractopamine HCl. For carcass characteristics, there were glycerol × ractopamine HCl interactions observed ($P < 0.05$) for percent yield and fat free lean index (FFLI). Adding either ractopamine HCl or glycerol to the control diet increased yield and FFLI; however, there were no additive effects when the combination of glycerol and ractopamine HCl was fed. Pigs fed ractopamine HCl had increased ($P < 0.04$) HCW, yield, loin depth, and FFLI. There was a glycerol × ractopamine HCl interaction ($P < 0.01$) observed for loin chop drip loss. Loin chop drip loss was numerically improved when glycerol and ractopamine HCl were added separately to the control diet; however, loin chop drip loss numerically decreased when the combination of glycerol and ractopamine HCl was fed. Glycerol did not affect ($P > 0.22$) loin characteristics. Ractopamine HCl tended to improve ($P < 0.08$) sirloin chop a* (redness) color. Neither ractopamine HCl nor glycerol influenced iodine value of belly fat, jowl fat, or backfat. In conclusion, pigs fed 5% glycerol had improved F/G, whereas pigs fed ractopamine HCl had improved growth and carcass characteristics and a tendency for improved loin a* color.

Key words: finishing pigs, glycerol, ractopamine HCl

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[1] Appreciation is expressed to Elanco Animal Health, Indianapolis IN, for partial funding of this trial.
[2] Appreciation is expressed to New Horizon Farms for use of pigs and facilities and Richard Brobjorg, Scott Heidebrink, and Marty Heintz for technical assistance.
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## Introduction

According to the National Biodiesel Board, in October 2007, there were 105 biodiesel production facilities operating and 77 facilities in the planning or construction stage in the United States. If all these facilities were operational, the estimated U.S. biodiesel production capacity would exceed 2.5 billon gal. This level of production would produce nearly 1.3 million tons of glycerol, the primary coproduct of biodiesel production. There has been much interest in utilizing crude glycerol as a feed ingredient in livestock diets. However, little is known about glycerol's nutritional value and its effect on carcass characteristics. Previous research from Europe has shown that water holding capacity is increased and the unsaturation index of carcass fat can be reduced when pigs are fed glycerol.

Ractopamine HCl (marketed as Paylean, Elanco Animal Health, Indianapolis, IN) is often fed to finishing pigs just before marketing to improve growth rate, F/G, yield, loin depth, and fat free lean index (FFLI). These improvements in growth and carcass traits are supported by a large number of studies evaluating the use of ractopamine HCl in finisher diets. The increased use of glycerol in swine diets coupled with the common practice of feeding ractopamine HCl to finishing pigs warrants evaluation of these ingredients together. Therefore, the objective of this trial was to evaluate the effect of dietary glycerol and ractopamine HCl on finishing pig performance, carcass characteristics, loin quality, and iodine value of belly fat, jowl fat, and backfat.

## Procedures

Procedures used in these experiments were approved by the Kansas State University Institutional Animal Care and Use Committee. The experiment was conducted at a commercial research facility in southwest Minnesota. The facility had a totally slatted floor, and each pen was equipped with a 4-hole dry self-feeder and 1 cup waterer. The facility was a double-curtain-sided deep-pit barn. The experiment was conducted in the winter of 2008.

A total of 1,054 barrows and gilts (PIC 337 × 1050, initially 207.8 lb) were used in the 28-d study. Pigs were randomly allotted and blocked to 1 of 4 dietary treatments with 7 pens per treatment. Each pen contained 25 to 27 barrows and gilts.

Pigs were fed corn-soybean meal-based experimental diets (Table 1) in meal form. Dietary treatments were arranged in a 2 × 2 factorial with main effects of glycerol (0 or 5%) and ractopamine HCl (0 or 6.75 g/ton). Glycerol from a soybean biodiesel production facility (Minnesota Soybean Processors, Brewster, MN) was used in the trial. All experimental diets were formulated to maintain a constant standardized ileal digestible (SID) lysine:ME ratio within those treatments that included or did not include ractopamine HCl. For glycerol, the NRC (1998) ME value of corn (1,551 kcal/lb) was used in diet formulation

Pigs and feeders were weighed on d 0, 7, 14, 21, and 28 to determine the response criteria of ADG, ADFI, and F/G. The pigs in this study were marketed in 2 different groups. First, on d 14, the barn was "topped" similar to normal marketing procedures in most commercial production operations. The 4 heaviest pigs from all pens were visually selected, removed, and marketed. The remaining pigs in the barn were marketed at the conclusion of the study (d 28).

At the end of the experiment, pigs from each pen were individually tattooed with pen number and shipped to JBS Swift & Company processing plant (Worthington, MN), where standard carcass criteria of carcass weight, loin and backfat depth, HCW, lean percentage,

and yield were collected. Fat-free lean index was also measured by using the equation 50.767 + (0.035 × HCW) – (8.979 × backfat).

Whole loins, jowl, backfat, and belly samples were collected on 1 barrow and 1 gilt randomly chosen from each pen from the d 28 marketing group for loin quality evaluation and fatty acid analysis. Jowl, backfat, and belly samples were collected and frozen until further processing and analysis.

After slaughter and for chilling 24 h, the loins were transported and stored at the Kansas State University Meat Laboratory at 32 to 38°F. Purge loss was measured 10 d postmortem by weighing the whole loin in the packaging material, removing the loin and blotting it dry, and reweighing the loin and dried packaging material. Purge loss was then calculated by subtracting the final loin weight from the initial loin weight. The value was then divided by the initial loin weight and multiplied by 100 to determine the percentage of purge loss. Loins were fabricated into 1-in. chops and allowed to bloom for at least 1 h prior to instrumental and visual color measurement. Color and pH measurements were taken on the *longissimus dorsi* muscle at 3 sections of the loin: the second chop anterior to the blade end, the center loin immediately posterior to the end of the *spinalis dorsi* muscle, and the second chop anterior to the sirloin end. Instrumental color was measured by using a Hunter Lab mini-scan colorimeter (Hunter Associated Laboratories Inc., Reston, VA.,) and reported as L* (lightness), a* (redness), and b* (yellowness). Visual color and marbling were evaluated by using the National Pork Producers Council's color and marbling standards (NPPC, 1998). Drip loss was conducted by utilizing a single 1-in. center cut chop from each loin. Each chop was weighed and placed into a plastic bag immediately following fabrication. This chop was then placed into refrigerated storage (32 to 38°F) for 24 h then reweighed to determine the amount of purge loss accumulation for the preceding 24-hour period. Loin pH was measured by utilizing an Accumet Basic pH Meter (Fisher Scientific, Waltham, MA, with a Pinnacle Series Gel Spear Point Electrode from Nova Analytics Corporation, Woburn, MA).

Fat samples were dissected from the jowl, loin, and backfat to analyze fatty acid composition. Iodine value was calculated from the following equation according to AOCS (1998) procedures:

C16:1(0.95)+C18:1(0.86)+C18:2(1.732)+C18:3(2.616)+C20:1(0.785)+C22:1(0.723).

The fatty acids results are represented as a percentage of the total fatty acids in the sample.

Data were analyzed as a randomized complete block design by using the PROC MIXED procedure of SAS with pen as the experimental unit. Main effects and interactions between pigs fed glycerol and ractopamine HCl were tested.

## Results and Discussion

Overall (d 0 to 28), there were no glycerol × ractopamine HCl interactions ($P > 0.10$) observed for growth performance (Table 2). Pigs fed dietary glycerol had improved ($P < 0.04$) F/G, but there was no effect on ($P > 0.14$) ADG or ADFI. Pigs fed diets with added ractopamine HCl had improved ($P < 0.01$) ADG and F/G and tended ($P > 0.08$) to have lower ADFI than pigs fed diets with no ractopamine HCl. For carcass characteristics, there were glycerol × ractopamine HCl interactions ($P < 0.05$) observed for percent yield and FFLI. Percent yield and FFLI were numerically improved when glycerol and ractopamine HCl were added separately to the control diet; however, no additive effects were found when the combination of glycerol and ractopamine HCl was fed. Feeding dietary glycerol did not influence ($P > 0.27$) any other carcass characteristics. Pigs fed ractopamine HCl had increased ($P < 0.04$) HCW, yield,

loin depth, and FFLI than pigs not fed ractopamine HCl.

For loin quality characteristics, there was a glycerol × ractopamine HCl interaction ($P < 0.01$) observed for loin chop drip loss (Table 3). Loin chop drip loss was numerically improved when glycerol and ractopamine HCl were added separately to the control diet; however, when the combination of glycerol and ractopamine HCl was fed, loin chop drip loss numerically decreased. Glycerol did not affect ($P > 0.22$) other loin quality characteristics. Ractopamine HCl tended to improve ($P < 0.08$) sirloin chop a* color, indicating the loin had more redness when ractopamine HCl was included in the diet.

For carcass fat quality, there tended to be a glycerol × ractopamine HCl interaction ($P < 0.07$) for total monounsaturated fatty acids at the jowl location (Table 4). Feeding dietary glycerol and ractopamine HCl did not influence ($P > 0.17$) jowl fat, belly fat, or backfat iodine value (Tables 5 and 6). Pigs fed diets with added ractopamine HCl tended to have increased ($P < 0.07$) total *trans* fatty acids at the jowl and backfat locations. Feeding dietary glycerol or ractopamine HCl did not influence ($P > 0.14$) saturated fatty acids, total polyunsaturated fatty acids, unsaturated fatty acid:saturated fatty acid, and polyunsaturated fatty acid:saturated fatty acid at the locations measured.

Because glycerol has been reported to have ME content similar to that of corn, we did not expect that adding up to 5% glycerol to the diet would influence growth performance. Thus, the improvement in F/G when glycerol was added to the diet was unexpected. The improvement in F/G was primarily due to the response to adding glycerol to the diet containing ractopamine HCl. We speculate that perhaps glycerol is a more available energy source than corn, resulting in more efficient tissue deposition than diets not containing added glycerol.

There is considerable data reporting the benefits of adding ractopamine HCl to late-finishing pig diets. These benefits include increased ADG and final BW and improved F/G in addition to increased percent yield, loin depth, and FFLI. Thus, the ractopamine HCl response in this study is consistent with previous research.

Feeding glycerol and ractopamine HCl in conjunction did improve loin chop drip loss more than feeding each ingredient separately. This finding warrants further research.

In conclusion, feeding pigs 5% glycerol improved F/G in pigs fed ractopamine HCl. As expected, pigs fed ractopamine HCl had improved growth and carcass characteristics and a tendency for improved sirloin chop a* color. Neither ractopamine HCl nor glycerol influenced iodine value at the locations measured.

**Table 1. Diet composition (as-fed basis)**[1]

| | Ractopamine HCl, g/ton | | | |
|---|---|---|---|---|
| | 0 | | 6.75 | |
| Ingredient, % | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol |
| Corn | 82.77 | 77.36 | 74.81 | 69.41 |
| Soybean meal (46.5% CP) | 15.24 | 15.64 | 23.19 | 23.59 |
| Glycerol | --- | 5.00 | --- | 5.00 |
| Ractopamine HCl (9 g/lb) | --- | --- | 0.04 | 0.04 |
| Monocalcium P (21% P) | 0.48 | 0.48 | 0.43 | 0.45 |
| Limestone | 0.90 | 0.90 | 0.88 | 0.85 |
| Salt | 0.35 | 0.35 | 0.35 | 0.35 |
| Vitamin premix | 0.04 | 0.04 | 0.04 | 0.04 |
| Trace mineral premix | 0.05 | 0.05 | 0.05 | 0.05 |
| Optiphos 2000[2] | 0.03 | 0.03 | 0.03 | 0.03 |
| L-Lysine HCl | 0.15 | 0.15 | 0.15 | 0.15 |
| DL-methionine | --- | --- | 0.02 | 0.02 |
| L-threonine | 0.01 | 0.01 | 0.03 | 0.03 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |
| | | | | |
| Calculated analysis | | | | |
| SID[3] amino acids, % | | | | |
| Lysine | 0.70 | 0.70 | 0.90 | 0.90 |
| Methionine:lysine | 31.37 | 30.54 | 30.36 | 29.71 |
| Met & Cys:lysine | 64.71 | 62.99 | 60.53 | 59.20 |
| Threonine:lysine | 64.23 | 63.67 | 64.27 | 63.84 |
| Tryptophan:lysine | 18.70 | 18.64 | 19.27 | 19.22 |
| SID lysine:calorie ratio, g/Mcal of ME | 2.09 | 2.09 | 2.69 | 2.69 |
| ME, kcal/lb | 1,521 | 1,521 | 1,520 | 1,520 |
| Total lysine, % | 0.79 | 0.79 | 1.01 | 1.01 |
| CP, % | 14.27 | 14.00 | 17.32 | 17.05 |
| Ca, % | 0.51 | 0.51 | 0.51 | 0.51 |
| P, % | 0.44 | 0.42 | 0.46 | 0.45 |
| Available P, %[4] | 0.22 | 0.22 | 0.22 | 0.22 |

[1] Fed from 208 to 259 lb.
[2] Provided per pound of diet: 227 phytase units of phytase.
[3] Standardized ileal digestible.
[4] Includes expected P release of .07% from added phytase.

**Table 2. Influence of crude glycerol and ractopamine HCl on finishing pig performance and carcass characteristics**[1]

| | Ractopamine HCl, g/ton | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 6.75 | | | Probability, *P* < | | |
| Item | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol | SE | Ractopamine HCl × Glycerol | Ractopamine HCl | Glycerol |
| d 0 to 28 | | | | | | | | |
| ADG, lb | 1.93 | 1.93 | 2.15 | 2.22 | 0.05 | 0.38 | 0.01 | 0.40 |
| ADFI, lb | 6.50 | 6.46 | 6.35 | 6.27 | 0.12 | 0.82 | 0.08 | 0.51 |
| F/G | 3.37 | 3.35 | 2.96 | 2.82 | 0.05 | 0.10 | 0.01 | 0.04 |
| Final wt, lb | 256.4 | 256.2 | 261.7 | 263.7 | 2.63 | 0.68 | 0.02 | 0.72 |
| | | | | | | | | |
| HCW, lb[2] | 189.3 | 192.0 | 199.5 | 199.2 | 1.95 | 0.46 | 0.01 | 0.53 |
| Yield, % | 74.63 | 75.85 | 76.26 | 75.91 | 0.37 | 0.05 | 0.04 | 0.27 |
| Backfat depth, in. | 0.71 | 0.70 | 0.67 | 0.70 | 0.01 | 0.06 | 0.17 | 0.34 |
| Loin depth, in. | 2.27 | 2.31 | 2.41 | 2.42 | 0.04 | 0.68 | 0.01 | 0.56 |
| FFLI, %[3] | 49.47 | 49.67 | 50.25 | 49.87 | 0.14 | 0.05 | 0.01 | 0.53 |
| Lean, % | 54.59 | 54.62 | 54.99 | 55.05 | 0.42 | 0.96 | 0.33 | 0.93 |

[1] A total of 1,054 pigs (initially BW, 207.8 lb) were used in a 28-d experiment with 25 to 27 pigs per pen with 10 pens per treatment.
[2] A total of 854 pigs were marketed on d 28 with 19 to 23 pigs per pen.
[3] Fat-free lean index.

**Table 3. Influence of glycerol and ractopamine HCl on loin characteristics**[1]

| | Ractopamine HCl, g/ton | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 6.75 | | | Probability, *P* < | | |
| Item | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol | SE | Ractopamine HCl × Glycerol | Ractopamine HCl | Glycerol |
| Loin purge loss, % | 0.13 | 0.15 | 0.16 | 0.15 | 0.02 | 0.65 | 0.46 | 0.77 |
| Loin chop drip loss, % | 1.89 | 2.61 | 2.47 | 2.03 | 0.18 | 0.01 | 0.99 | 0.45 |
| NPPC marbling standard score[2] | 1.50 | 1.70 | 1.45 | 1.42 | 0.12 | 0.33 | 0.17 | 0.48 |
| NPPC color standard score[3] | 3.10 | 3.13 | 3.15 | 3.36 | 0.09 | 0.34 | 0.14 | 0.22 |
| Loin chop pH | | | | | | | | |
| Blade | 5.89 | 5.92 | 5.89 | 5.85 | 0.05 | 0.41 | 0.41 | 0.90 |
| Middle | 5.70 | 5.67 | 5.66 | 5.67 | 0.03 | 0.52 | 0.60 | 0.65 |
| Sirloin | 5.70 | 5.71 | 5.69 | 5.68 | 0.02 | 0.76 | 0.40 | 0.93 |
| Center cut chop color | | | | | | | | |
| L*[4] | 55.45 | 56.03 | 55.54 | 54.54 | 0.62 | 0.15 | 0.20 | 0.70 |
| a*[5] | 9.54 | 9.73 | 10.20 | 9.66 | 0.34 | 0.28 | 0.37 | 0.60 |
| b*[6] | 14.41 | 14.56 | 14.72 | 14.16 | 0.39 | 0.38 | 0.90 | 0.62 |
| Sirloin chop color | | | | | | | | |
| L* | 58.78 | 59.51 | 59.29 | 58.10 | 0.56 | 0.10 | 0.43 | 0.68 |
| a* | 9.32 | 9.04 | 9.78 | 9.71 | 0.31 | 0.74 | 0.08 | 0.59 |
| b* | 14.59 | 14.69 | 14.84 | 14.44 | 0.38 | 0.51 | 0.99 | 0.69 |

[1] A total of 80 loins were used in the experiment with 2 loins per pen and 10 pens per treatment.
[2] 1 = pale pinkish grapy to white, 2 = grayish pink, 3 = reddish pink, 4 = dark reddish pink, 5 = purplish red, 6 = dark purplish red (NPPC, 1999).
[3] Visual scale, which approximates the percentage of intramuscular fat content (NPPC, 1999).
[4] L*, 0 = black and 100 = perfect white.
[5] Positive a* indicates increasing redness.
[6] Positive b* indicates increasing yellowness.

**Table 4. Influence of glycerol and ractopamine HCl on finishing pig jowl fat quality**[1,2]

| | Ractopamine HCl, g/ton | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 6.75 | | | Probability, *P* < | | |
| Item | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol | SE | Ractopamine HCl × Glycerol | Ractopamine HCl | Glycerol |
| Myristic acid (14:0), % | 1.35 | 1.38 | 1.39 | 1.34 | 0.03 | 0.18 | 0.82 | 0.76 |
| Palmitic acid (16:0), % | 21.90 | 22.00 | 21.89 | 21.52 | 0.25 | 0.36 | 0.33 | 0.58 |
| Palmitoleic acid (16:1), % | 2.73 | 2.76 | 2.87 | 2.72 | 0.08 | 0.26 | 0.57 | 0.49 |
| Margaric acid (17:0), % | 0.48 | 0.51 | 0.48 | 0.49 | 0.02 | 0.65 | 0.62 | 0.24 |
| Stearic acid (18:0), % | 9.24 | 9.48 | 9.08 | 9.08 | 0.22 | 0.57 | 0.22 | 0.59 |
| Oleic acid (18:1c9), % | 41.98 | 41.96 | 41.86 | 41.89 | 0.30 | 0.94 | 0.75 | 0.99 |
| Vaccenic acid (18:1n7), % | 3.64 | 3.74 | 3.79 | 3.63 | 0.12 | 0.11 | 0.78 | 0.68 |
| Linoleic acid (18:2n6), % | 14.38 | 13.97 | 14.37 | 15.03 | 0.40 | 0.19 | 0.20 | 0.75 |
| α-linolenic acid (18:3n3), % | 0.62 | 0.60 | 0.62 | 0.64 | 0.02 | 0.28 | 0.15 | 0.93 |
| γ-linolenic acid (18:3n6), % | 0.62 | 0.60 | 0.62 | 0.64 | 0.02 | 0.28 | 0.15 | 0.93 |
| Arachidic acid (20:0), % | 0.20 | 0.20 | 0.20 | 0.18 | 0.01 | 0.29 | 0.15 | 0.66 |
| Eicosadienoic acid (20:2), % | 0.85 | 0.83 | 0.86 | 0.88 | 0.02 | 0.47 | 0.20 | 0.89 |
| Arachidonic acid (20:4n6), % | 0.11 | 0.10 | 0.11 | 0.11 | 0.01 | 1.00 | 0.29 | 0.35 |
| Other fatty acids, % | 2.45 | 2.39 | 2.40 | 2.43 | 0.05 | 0.32 | 0.97 | 0.74 |
| Total SFA, %[3] | 33.57 | 33.99 | 33.44 | 33.03 | 0.43 | 0.34 | 0.21 | 1.00 |
| Total MUFA, %[4] | 50.03 | 50.11 | 50.16 | 49.87 | 0.35 | 0.61 | 0.88 | 0.76 |
| Total PUFA, %[5] | 16.39 | 15.91 | 16.40 | 17.10 | 0.44 | 0.18 | 0.18 | 0.80 |
| Total *trans* fatty acids, %[6] | 41.03 | 40.95 | 42.16 | 42.81 | 0.80 | 0.65 | 0.07 | 0.73 |
| UFA:SFA ratio[7] | 1.98 | 1.95 | 1.99 | 2.03 | 0.04 | 0.33 | 0.21 | 0.98 |
| PUFA:SFA ratio[8] | 0.49 | 0.47 | 0.49 | 0.52 | 0.02 | 0.21 | 0.18 | 0.81 |
| Iodine value, g/100 g[9] | 69.6 | 68.9 | 69.7 | 70.7 | 0.7 | 0.22 | 0.17 | 0.87 |

[1] A total of 1,054 pigs (initially BW, 207.8 lb) were used in a 28-d experiment with 25 to 27 pigs per pen and 10 pens per treatment.
[2] A total of 854 pigs were marketed on d 28 with 19 to 23 pigs per pen and 10 pens per treatment. Values are the mean of 1 gilt and 1 barrow per pen (10 barrows and 10 gilts per treatment).
[3] Total saturated fatty acids (SFA) = {[C8:0] + [C10:0] + [C12:0] + [C14:0] + [C16:0] + [C17:0] + [C18:0] + [C20:0] + [C22:0] + [C24:0]}, where the brackets indicate concentration.
[4] Total monounsaturated fatty acids (MUFA) = {[C14:1] + [C16:1] + [C18:1c9] + [C18:1n7] + [C20:1] + [C24:1]}, where the brackets indicate concentration.
[5] Total polyunsaturated fatty acids (PUFA) = {[C18:2n6] + [C18:3n3] + [C18:3n6] + [C20:2] + [C20:4n6]}, where the brackets indicate concentration.
[6] Total *trans* fatty acids = {[C18:1t] + [C18:2t] + [C18:3t]}, where the brackets indicate concentration.
[7] Unsaturated fatty acids (UFA):SFA ratio = [Total MUFA + Total PUFA] / Total SFA.
[8] PUFA:SFA ratio = Total PUFA / Total SFA.
[9] Calculated as IV = [C16:1] × 0.95 + [C18:1] × 0.86 + [C18:2] × 1.732 +[C18:3] × 2.616 + [C20:1] × 0.785+[C22:1] × 0.723, where the brackets indicate concentration (AOCS, 1998).

**Table 5. Influence of glycerol and ractopamine HCl on finishing pig belly fat quality**[1,2]

| | Ractopamine HCl, g/ton | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 6.75 | | | Probability, *P* < | | |
| Item | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol | SE | Ractopamine HCl × Glycerol | Ractopamine HCl | Glycerol |
| Myristic acid (14:0), % | 1.29 | 1.30 | 1.32 | 1.30 | 0.04 | 0.65 | 0.82 | 0.89 |
| Palmitic acid (16:0), % | 22.73 | 22.16 | 22.53 | 22.26 | 0.50 | 0.72 | 0.90 | 0.33 |
| Palmitoleic acid (16:1), % | 1.99 | 2.27 | 2.30 | 2.24 | 0.11 | 0.07 | 0.14 | 0.22 |
| Margaric acid (17:0), % | 0.61 | 0.55 | 0.46 | 0.58 | 0.04 | 0.03 | 0.10 | 0.35 |
| Stearic acid (18:0), % | 11.45 | 10.43 | 10.47 | 10.74 | 0.58 | 0.20 | 0.49 | 0.45 |
| Oleic acid (18:1c9), % | 38.63 | 39.63 | 39.60 | 39.24 | 0.65 | 0.22 | 0.58 | 0.55 |
| Vaccenic acid (18:1n7), % | 2.70 | 3.11 | 3.18 | 3.04 | 0.14 | 0.01 | 0.02 | 0.11 |
| Linoleic acid (18:2n6), % | 16.29 | 16.27 | 15.99 | 16.35 | 0.80 | 0.78 | 0.88 | 0.80 |
| α-linolenic acid (18:3n3), % | 0.67 | 0.68 | 0.66 | 0.66 | 0.03 | 0.91 | 0.65 | 0.95 |
| γ-linolenic acid (18:3n6), % | 0.67 | 0.68 | 0.66 | 0.66 | 0.03 | 0.91 | 0.65 | 0.95 |
| Arachidic acid (20:0), % | 0.26 | 0.23 | 0.23 | 0.22 | 0.02 | 0.70 | 0.19 | 0.22 |
| Eicosadienoic acid (20:2), % | 0.88 | 0.89 | 0.87 | 0.90 | 0.04 | 0.87 | 0.98 | 0.61 |
| Arachidonic acid (20:4n6), % | 0.10 | 0.09 | 0.11 | 0.11 | 0.02 | 0.80 | 0.33 | 0.63 |
| Other fatty acids, % | 2.29 | 2.31 | 2.29 | 2.31 | 0.06 | 0.90 | 0.96 | 0.58 |
| Total SFA, %[3] | 36.72 | 35.11 | 35.40 | 35.49 | 1.05 | 0.34 | 0.60 | 0.40 |
| Total MUFA, %[4] | 44.85 | 46.56 | 46.59 | 46.06 | 0.77 | 0.07 | 0.29 | 0.32 |
| Total PUFA, %[5] | 18.34 | 18.34 | 18.00 | 18.45 | 0.86 | 0.76 | 0.88 | 0.76 |
| Total *trans* fatty acids, %[6] | 44.56 | 45.13 | 48.01 | 44.94 | 1.67 | 0.21 | 0.26 | 0.38 |
| UFA:SFA ratio[7] | 1.73 | 1.85 | 1.83 | 1.83 | 0.08 | 0.37 | 0.60 | 0.39 |
| PUFA:SFA ratio[8] | 0.50 | 0.53 | 0.51 | 0.52 | 0.04 | 0.84 | 0.97 | 0.57 |
| Iodine value, g/100 g[9] | 68.6 | 70.0 | 69.6 | 69.7 | 1.49 | 0.62 | 0.80 | 0.54 |

[1] A total of 1,054 pigs (initially BW, 207.8 lb) were used in a 28-d experiment with 25 to 27 pigs per pen and 10 pens per treatment.
[2] A total of 854 pigs were marketed on d 28 with 19 to 23 pigs per pen and 10 pens per treatment. Values are the mean of 1 gilt and 1 barrow per pen (10 barrows and 10 gilts per treatment).
[3] Total saturated fatty acids (SFA) = {[C8:0] + [C10:0] + [C12:0] + [C14:0] + [C16:0] + [C17:0] + [C18:0] + [C20:0] + [C22:0] + [C24:0]}, where the brackets indicate concentration.
[4] Total monounsaturated fatty acids (MUFA)= {[C14:1] + [C16:1] + [C18:1c9] + [C18:1n7] + [C20:1] + [C24:1]}, where the brackets indicate concentration.
[5] Total polyunsaturated fatty acids (PUFA) = {[C18:2n6] + [C18:3n3] + [C18:3n6] + [C20:2] + [C20:4n6]}, where the brackets indicate concentration.
[6] Total *trans* fatty acids = {[C18:1t] + [C18:2t] + [C18:3t]}, where the brackets indicate concentration.
[7] Unsaturated fatty acids (UFA):SFA ratio = [Total MUFA + Total PUFA] / Total SFA.
[8] PUFA:SFA ratio = Total PUFA / Total SFA.
[9] Calculated as IV = [C16:1] × 0.95 + [C18:1] × 0.86 + [C18:2] × 1.732 +[C18:3] × 2.616 + [C20:1] × 0.785+[C22:1] × 0.723, where the brackets indicate concentration (AOCS, 1998).

**Table 6. Influence of glycerol and ractopamine HCl on finishing pig backfat quality**[1,2]

| | Ractopamine HCl, g/ton | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 g/ton | | 6.75 g/ton | | | Probability, *P* < | | |
| Item | 0% glycerol | 5% glycerol | 0% glycerol | 5% glycerol | SE | Ractopamine HCl × Glycerol | Ractopamine HCl | Glycerol |
| Myristic acid (14:0), % | 1.30 | 1.37 | 1.35 | 1.31 | 0.03 | 0.09 | 0.83 | 0.67 |
| Palmitic acid (16:0), % | 22.83 | 23.21 | 23.31 | 23.08 | 0.28 | 0.28 | 0.52 | 0.79 |
| Palmitoleic acid (16:1), % | 2.08 | 2.22 | 2.25 | 2.11 | 0.10 | 0.12 | 0.75 | 0.94 |
| Margaric acid (17:0), % | 0.60 | 0.59 | 0.56 | 0.58 | 0.03 | 0.57 | 0.30 | 0.92 |
| Stearic acid (18:0), % | 11.36 | 11.56 | 11.44 | 11.71 | 0.27 | 0.91 | 0.68 | 0.40 |
| Oleic acid (18:1c9), % | 38.05 | 38.05 | 38.24 | 38.04 | 0.33 | 0.77 | 0.79 | 0.76 |
| Vaccenic acid (18:1n7), % | 2.85 | 2.95 | 2.99 | 2.86 | 0.13 | 0.17 | 0.79 | 0.83 |
| Linoleic acid (18:2n6), % | 16.73 | 15.97 | 15.85 | 16.37 | 0.43 | 0.14 | 0.58 | 0.79 |
| α-linolenic acid (18:3n3), % | 0.68 | 0.66 | 0.64 | 0.66 | 0.02 | 0.35 | 0.35 | 0.85 |
| γ-linolenic acid (18:3n6), % | 0.68 | 0.66 | 0.64 | 0.66 | 0.02 | 0.35 | 0.35 | 0.85 |
| Arachidic acid (20:0), % | 0.24 | 0.26 | 0.24 | 0.22 | 0.01 | 0.09 | 0.11 | 0.83 |
| Eicosadienoic acid (20:2), % | 0.84 | 0.79 | 0.81 | 0.80 | 0.02 | 0.51 | 0.68 | 0.13 |
| Arachidonic acid (20:4n6), % | 0.11 | 0.09 | 0.10 | 0.09 | 0.01 | 0.51 | 0.29 | 0.12 |
| Other fatty acids, % | 2.26 | 2.20 | 2.16 | 2.11 | 0.04 | 0.89 | 0.02 | 0.16 |
| Total SFA, %[3] | 36.75 | 37.45 | 37.30 | 37.27 | 0.48 | 0.45 | 0.69 | 0.48 |
| Total MUFA, %[4] | 44.49 | 44.64 | 44.94 | 44.41 | 0.42 | 0.43 | 0.80 | 0.67 |
| Total PUFA, %[5] | 18.76 | 17.91 | 17.77 | 18.32 | 0.46 | 0.14 | 0.53 | 0.74 |
| Total *trans* fatty acids, %[6] | 42.45 | 41.90 | 44.43 | 42.59 | 0.69 | 0.36 | 0.06 | 0.10 |
| UFA:SFA ratio[7] | 1.73 | 1.67 | 1.68 | 1.69 | 0.03 | 0.41 | 0.70 | 0.48 |
| PUFA:SFA ratio[8] | 0.51 | 0.48 | 0.48 | 0.49 | 0.02 | 0.17 | 0.54 | 0.66 |
| Iodine value, g/100 g[9] | 69.0 | 67.8 | 67.8 | 68.3 | 0.70 | 0.23 | 0.61 | 0.64 |

[1] A total of 1,054 pigs (initially BW, 207.8 lb) were used in a 28-d experiment with 25 to 27 pigs per pen and 10 pens per treatment.

[2] A total of 854 pigs were marketed on d 28 with 19 to 23 pigs per pen and 10 pens per treatment. Values are the mean of 1 gilt and 1 barrow per pen (10 barrows and 10 gilts per treatment).

[3] Total saturated fatty acids (SFA) = {[C8:0] + [C10:0] + [C12:0] + [C14:0] + [C16:0] + [C17:0] + [C18:0] + [C20:0] + [C22:0] + [C24:0]}, where the brackets indicate concentration.

[4] Total monounsaturated fatty acids (MUFA) = {[C14:1] + [C16:1] + [C18:1c9] + [C18:1n7] + [C20:1] + [C24:1]}, where the brackets indicate concentration.

[5] Total polyunsaturated fatty acids (PUFA) = {[C18:2n6] + [C18:3n3] + [C18:3n6] + [C20:2] + [C20:4n6]}, where the brackets indicate concentration.

[6] Total *trans* fatty acids = {[C18:1t] + [C18:2t] + [C18:3t]}, where the brackets indicate concentration.

[7] Unsaturated fatty acids (UFA):SFA ratio = [Total MUFA + Total PUFA] / Total SFA.

[8] PUFA:SFA ratio = Total PUFA / Total SFA.

[9] Calculated as IV= [C16:1] × 0.95 + [C18:1] × 0.86 + [C18:2] × 1.732 +[C18:3] × 2.616 + [C20:1] × 0.785+[C22:1] × 0.723, where the brackets indicate concentration (AOCS, 1998).