**163 Dose titration of Optaflexx®(ractopamine HCl) evaluating the effects on growth performance in feedlot steers.** A. Schroeder*, D. Hancock, D. Mowrey, S. Laudert, G. Vogel, and D. Polser, *Elanco Animal Health*, *Greenfield, IN*.

The effect of feeding Optaflexx®, ractopamine HCl, (RAC), was evaluated at five geographic sites. A randomized complete block design was used at each site. This resulted in a total of 25 experimental units (8-10 steers/pen) per Optaflexx concentration. Eight hundred eighty (880) yearling steers and steer calves were assigned to one of four treatments (0, 10, 20, 30 ppm, 100% DM). The studies were conducted during different seasons for either 28 or 42 d immediately prior to harvest. Crude protein levels ranged from 13.03 to 15.23% at the various individual study sites. Least square means are given in the following table:

Steers consumed approximately 0, 100, 200 and 300 mg/hd/d of ractopamine for each Optaflexx treatment. Feeding RAC did not change feed intake. Linear contrasts showed RAC improved (P < 0.05) ADG, F/G, G/F and HCW for all treatment groups compare to controls, when fed for the last 28 to 42 days of the finishing period. Dressing percent was improved (P < 0.05) for the 20 and 30 ppm RAC groups. These data demonstrate that RAC when fed for the last 28 to 42 d of the finishing period, improves growth performance in steers.

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| Initial weight, kg | 530.44 | 530.07 | 529.76 | 529.44 | 58.51 |
| Final weight, kg | 575.52[b] | 582.28[a] | 582.69[a] | 585.41[a] | 20.87 |
| Daily feed, kg | 9.86 | 9.98 | 9.86 | 9.90 | 0.49 |
| ADG. kg | 1.27[b] | 1.49[a] | 1.52[a] | 1.60[a] | 0.15 |
| Feed/Gain | 8.10[b] | 7.00[a] | 6.81[a] | 6.44[a] | 0.41 |
| Gain/Feed | 0.126[b] | 0.147[a] | 0.152[a] | 0.159[a] | 0.009 |
| HCW, kg | 341.74[b] | 344.69[a] | 348.14[a] | 350.00[a] | 13.15 |
| Dress, percent | 61.9[b] | 61.7[b] | 62.2[a] | 62.3[a] | 0.73 |

[ab]Means differ (P < 0.05)

**Key Words:** Beef, Growth, Optaflexx, Ractopamine

**164 Dose titration of Optaflexx® (ractopamine HCl) evaluating the effects on standard carcass characteristics in feedlot steers.** A. Schroeder*, D. Hancock, D. Mowrey, S. Laudert, G. Vogel, and D. Polser, *Elanco Animal Health*, *Greenfield, IN*.

Optaflexx®, ractopamine HCl, (RAC), was recently approved by the US FDA CVM for feeding to cattle during the last 28 to 42 of the finishing period. The effects of feeding Optaflexx on standard carcass characteristics in beef steers assigned to one of four treatments (0, 10, 20, or 30 ppm, 100% DM), was evaluated at five different geographical sites. A randomized complete block design was used at each site. This resulted in a total of 25 experimental units (8-10 steers/pen) per Optaflexx concentration. Harvest was conducted in commercial beef packing plants. Following a 18 to 24 hour chill, carcasses were ribbed and standard carcass measurements collected. Least squares means are given in the following table:

HCW and LM area were increased (P < 0.05) by feeding RAC. 12th rib fat thickness and KPH were not affected by RAC treatments. Yield grade tended (P = 0.058) to be improved at 20 ppm and was improved (P < 0.05) at 30 ppm. Marbling score and carcass maturity were not affected by RAC treatment. Muscle color, firmness and texture were not affected by RAC treatments. These data demonstrate that feeding RAC increased HCW, LM area and conformation scores without impacting carcass quality when fed for the last 28 to 42 days of the finishing period.

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| HCW, kg | 341.74[b] | 344.69[a] | 348.14[a] | 350.0[a] | 13.15 |
| 12th rib fat, cm | 1.45 | 1.42 | 1.42 | 1.42 | 0.13 |
| KPH,% | 1.83 | 1.83 | 1.86 | 1.77 | 0.13 |
| LM area, $cm^2$ | 77.4[b] | 79.3[a] | 80.0[a] | 80.6[a] | 2.77 |
| Yield grade | 3.32[b] | 3.24[b] | 3.22[b] | 3.18[a] | 0.17 |
| Marbling score | Sm[33] | Sm[28] | Sm[31] | Sm[25] | 18.2 |
| Maturity | A[56] | A[55] | A[57] | A[55] | 2.5 |
| Conformation | low Ch[80b] | low Ch[93b] | ave Ch[14a] | ave Ch[17a] | 0.34 |
| Muscle color[c] | 6.0 | 6.1 | 6.1 | 6.0 | 0.12 |
| Muscle firmness[c] | 6.1 | 6.3 | 6.2 | 6.2 | 0.13 |
| Dark cutters, % | 5.1 | 2.7 | 2.3 | 3.2 | |

[ab]Means differ (P < 0.05) [c] scale: 1 = undesirable, 7 = most desirable

**Key Words:** Beef, Carcass, Optaflexx, Ractopamine

**165 Dose titration of Optaflexx® (ractopamine HCl) evaluating the effects on composition of carcass soft tissues in feedlot steers.** A. Schroeder, D. Hancock, D. Mowrey*, S. Laudert, G. Vogel, and D. Polser, *Elanco Animal Health*, *Greenfield, IN*.

The effect of Optaflexx®, ractopamine HCl, (RAC), on the composition of carcass soft tissues (ST) of beef steers was evaluated at five different geographical sites. A randomized complete block design was used at each site. Steers were assigned to one of four treatments (0,10,20,or 30 ppm, 100% DM). This resulted in a total of 25 experimental units (8-10 steers/pen) per Optaflexx concentration. RAC was fed for the last 28 or 42 days of the finishing period immediately prior to harvest. Harvest was conducted in commercial beef packing plants. Up to two carcass sides were randomly selected from carcasses in each experimental unit, which had hot carcass weights (HCW) within +/-11.33 kg of the mean HCW in each block. The sides were dissected into ST (muscle and fat), bone (bone and connective tissue) and other tissues (kidney, pelvic, heart fat, diaphram and hanging tender). ST of each side was coarse ground, thoroughly mixed, reground, and sub-sampled. The subsamples were homogenized and three aliquots collected and frozen. Moisture, ether extractable lipid (EEL), protein (N x 6.25) and ash content were determined using AOAC methods. Baseline composition on contemporary animals (n=110) was collected to calculate carcass protein gain per day and efficiency of carcass protein gain per day.

Carcass bone and ash were not different between treatment groups. Carcass protein content was increased (P < 0.05) at 20 and 30 ppm RAC concentrations compared to controls. EEL was decreased (P < 0.05) at 20 ppm compared to control. Carcass protein gain per day increased (P < 0.05) by 100.9% and 114.4% at 20 and 30 ppm, respectively. Efficiency of carcass protein gained per day was improved (P < 0.05) 120% at 20 and 30 ppm. The results indicate RAC increased carcass protein (leanness) in feedlot steers when fed for the last 28 to 42 of the finishing phase.

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| No. Pens | 25 | 25 | 25 | 24 | |
| No. Carcasses | 50 | 50 | 49 | 47 | |
| Side soft tissue, kg | 140.3 | 139.4 | 140.3 | 141.2 | 4.13 |
| Carcass bone, % | 14.7 | 14.7 | 14.7 | 14.5 | 0.26 |
| Protein, % | 14.82[b] | 15.15[b] | 15.35[a] | 15.35[a] | 0.14 |
| Moisture, % | 52.5[b] | 53.1[b] | 53.7[a] | 53.4[b] | 0.58 |
| EEL, % | 31.2[b] | 30.3[b] | 29.5[a] | 29.7[b] | 0.74 |
| Ash, % | 0.8 | 0.8 | 0.8 | 0.8 | 0.02 |
| Carcass protein gain per day, g | 50.4[b] | 80.3[b] | 101.2[a] | 108.0[a] | 27.2 |
| Efficiency of carcass gain per day | 0.005[b] | 0.008[b] | 0.011[a] | 0.011[a] | 0.003 |

[ab]Means differ (P <0.05)

**Key Words:** Beef, Carcass, Optaflexx, Ractopamine

**166 Effects of ractopamine fed to finishing steers, I - summary of six studies - growth performance.** S. Laudert*, G. Vogel, A. Schroeder, W. Platter, and M. Van Koevering, *Elanco Animal Health*, *Greenfield, IN*.

Six large pen (60 to 112 head per pen) studies were conducted at commercial feedlot research facilities to characterize the effects of ractopamine hydrochloride (RAC) on growth performance and carcass traits of steers fed in typical feedlot conditions. Rations were representative of feedlots in the respective geographical area and met or exceeded National Research Council nutrient requirements for finishing steers. All steers were administered a terminal implant containing estradiol and trenbolone acetate at least 90 days preharvest. RAC was fed to achieve intakes of 0 (CON), 100 (LOW) or 200 (MID) mg•hd$^{-1}$•d$^{-1}$ during the final 28 to 32 days of finishing. Analyses were conducted using the least squares, mixed model procedure of SAS with pen as the experimental unit and initial live weight as a covariate. RAC increased final live weight ($P < 0.05$). RAC did not impact dry matter intake ($P > 0.05$). RAC improved ($P < 0.05$) average daily gain (9.4 and 17.4%), feed:gain (9.2 and 15.9%) and gain:feed (9.9 and 17.8%), respectively, over CON. Total gain was increased by 3.6 and 6.7 kg for the LOW and MID treatments. Feeding RAC to steers for the final 28 to 32 d of the finishing period in typical feedlot conditions increases live weight gain and improves feed efficiency.

**Growth performance of steers fed ractopamine**

| RAC, mg·hd$^{-1}$·d$^{-1}$ | 0 | 100 | 200 | SE |
|---|---|---|---|---|
| No pens | 32 | 28 | 32 | |
| No head | 2413 | 2132 | 2419 | |
| Final weight, kg | 586.2[c] | 589.9[b] | 592.9[a] | 3.13 |
| Dry matter intake, kg | 9.08 | 9.03 | 9.04 | 0.20 |
| Average daily gain, kg | 1.38[c] | 1.51[b] | 1.62[a] | 0.11 |
| Feed:Gain | 6.74[c] | 6.12[b] | 5.67[a] | 0.32 |
| Gain:Feed | 0.152[c] | 0.167[b] | 0.179[a] | 0.009 |

[abc] Means differ ($P < 0.05$)

**Key Words:** Ractopamine, Beef Steers, Growth

**167 Effects of ractopamine fed to finishing steers, II - summary of six studies - carcass traits.** S. Laudert, G. Vogel, A. Schroeder, W. Platter*, and M. Van Koevering, *Elanco Animal Health*, *Greenfield, IN*.

Six large pen (60 to 112 head per pen) studies were conducted at commercial feedlot research facilities to characterize the effects of ractopamine hydrochloride (RAC) on growth performance and carcass traits of steers fed in typical feedlot conditions. Rations were representative of feedlots in the respective geographical area and met or exceeded National Research Council nutrient requirements for finishing steers. All steers were administered a terminal implant containing estradiol and trenbolone acetate at least 90 days preharvest. RAC was fed to achieve intakes of 0 (CON), 100 (LOW) or 200 (MID) mg•hd$^{-1}$•d$^{-1}$ during the final 28 to 32 days of finishing. Analyses were conducted using the least squares, mixed model procedure of SAS with pen as the experimental unit and initial live weight as a covariate. Frequency distributions were compared using the GLIMMIX macro of SAS. Carcasses produced by steers in the LOW and MID treatments were heavier ($P < 0.05$) than carcasses of CON steers by 2.4 and 5.6 kg, respectively. Dressing percentage was highest ($P < 0.05$) for steers in the MID treatment. Carcass loin muscle area increased ($P < 0.05$) as steers were fed higher levels of RAC (CON < LOW < MID). Marbling score and percentage of carcasses grading Choice and Prime were not affected by RAC treatment. Twelfth rib fat thickness, KPH, yield grade, carcass maturity and incidence of dark cutters were not affected by feeding RAC. These results suggest that ractopamine can increase carcass weight and loin muscle area of steers when fed at levels of 100 and 200 mg·hd$^{-1}$·d$^{-1}$ and increase dressing percentage when fed at 200 mg·hd$^{-1}$·d$^{-1}$ for the last 28 to 32 days of the finishing period in typical feedlot conditions.

**Carcass traits of steers fed ractopamine**

| RAC, mg·hd$^{-1}$·d$^{-1}$ | 0 | 100 | 200 | SE |
|---|---|---|---|---|
| No Pens | 32 | 28 | 32 | |
| No Carcasses | 2413 | 2132 | 2419 | |
| Hot weight, kg | 374.4[c] | 376.8[b] | 380.0[a] | 1.68 |
| % dress | 63.85[b] | 63.87[b] | 64.08[a] | 0.24 |
| 12$^{th}$ rib fat, cm | 1.30 | 1.27 | 1.30 | 0.10 |
| Loin area, cm$^2$ | 89.0[c] | 89.7[b] | 91.0[a] | 1.74 |
| Yield grade | 2.87 | 2.85 | 2.84 | 0.14 |
| Marbling score | small[04] | small[04] | small[01] | 6.40 |
| % choice & prime | 47.6 | 48.5 | 45.6 | |

[abc] Means differ ($P < 0.05$)

**Key Words:** Ractopamine, Beef steers, Carcass Traits

**168 Effect of ractopamine on growth performance of calf-fed Holstein steers.** G. Vogel*[1], A. Schroeder[1], W. Platter[1], M. Van Koevering[1], A. Aguilar[1], S. Laudert[1], J. Beckett[2], J. Droulliard[3], G. Duff[4], and J. Elam[5], [1]*Elanco Animal Health*, *Greenfield, IN*, [2]*California Polytechnic State University*, *San Luis Obispo*, [3]*Kansas State University*, *Manhattan*, [4]*University of Arizona*, *Tuscon*, [5]*Agricultural Technology*, *Santa Ynez, CA*.

A series of four studies using 1914 calf-fed Holstein steers (543 kg) was conducted to evaluate the effects of ractopamine hydrochloride (RAC) on growth performance when fed for the final 28 to 38 days of the finishing period. At each study site, RAC was incorporated into the ration to achieve intakes of approximately 0 (CON), 200 (MID) and 300 (HIGH) mg*hd$^{-1}$*d$^{-1}$. Each study consisted of four to eight pen replicates per treatment with 13 to 72 steers/pen depending on study site. Analyses of these data were conducted using the SAS mixed model procedure. The statistical model included treatment as an independent fixed effect, average initial live weight as a covariate, and study and replicate within study as random effects. Feed intake for steers fed either level of RAC was not different compared to the CON level. Daily gain was increased ($P < 0.05$) by 0.24 and 0.20 kg/d for MID and HIGH, respectively compared to steers in the CON treatment. Feed efficiency was improved ($P < 0.05$) by 14.4% and 14.3% for steers in MID and HIGH, respectively. Carcasses produced by steers in the MID and HIGH treatments were heavier ($P < 0.05$) than steers in the CON treatment by 4.7 and 5.1 kg, respectively. These data demonstrate that RAC improves growth performance in calf-fed Holsteins during the final portion of the finishing period.

**RAC (mg•hd$^{-1}$•d$^{-1}$)**

| RAC | 0 | 200 | 300 | SE |
|---|---|---|---|---|
| Final Weight, kg | 585.8[b] | 593.8[a] | 592.6[a] | 2.9 |
| Daily Feed, kg | 9.36 | 9.59 | 9.18 | 0.19 |
| Daily Gain, kg | 1.37[b] | 1.61[a] | 1.57[a] | 0.06 |
| Daily Gain, kg | 1.37[b] | 1.61[a] | 1.57[a] | 0.06 |
| Feed:Gain | 7.08[a] | 6.06[b] | 6.07[6.07] | 0.25 |
| Feed:Gain | 7.08[a] | 6.06[b] | 6.07[b] | 0.25 |
| Gain:Feed | 0.15[b] | 0.16[a] | 0.17[a] | 0.01 |

**Key Words:** Ractopamine, Holstein, Growth

**169 Effect of ractopamine on carcass characteristics of calf-fed Holstein steers.** G. Vogel*[1], A. Schroeder[1], W. Platter[1], M. Van Koevering[1], A. Aguilar[1], S. Laudert[1], J. Beckett[2], R. Delmore[2], J. Droulliard[3], G. Duff[4], and J. Elam[5], [1]*Elanco Animal Health*, *Greenfield, IN*, [2]*California Polytechnic State University*, *San Luis Obispo*, [3]*Kansas State University*, *Manhattan*, [4]*University of Arizona*, *Tuscon*, [5]*Agricultural Technology*, *Santa Ynez, CA*.

A series of four studies using 1914 calf-fed Holstein steers (543 kg) was conducted to evaluate the effects of ractopamine hydrochloride (RAC) on growth performance and carcass characteristics when fed for the final 28 to 38 days of the finishing period. At each study site, RAC was incorporated into the ration to achieve intakes of approximately 0 (CON), 200 (MID) and 300 (HIGH) mg*hd$^{-1}$*d$^{-1}$. Each study consisted of four to eight pen replicates per treatment with 13 to 72 steers/pen depending on study site. Analyses of these data were conducted using the SAS mixed model procedure. The statistical model included treatment as an independent fixed effect, average initial live weight as a covariate, and study and replicate within study as random effects. Carcasses produced by steers in the MID and HIGH treatments were heavier ($P < 0.05$) than steers in the CON treatment by 4.7 and 5.1 kg, respectively. Mean LM of carcasses from the MID and HIGH treatments were 1.8 and 2.8 cm$^2$ larger ($P < 0.05$) than CON carcasses. Calculated yield grade was decreased ($P < 0.05$) by 0.14 units for steers in the HIGH group. Feeding RAC did not affect percent KPH, carcass maturity, or the incidence of dark cutting beef. Feeding RAC resulted in a reduction ($P < 0.05$) in marbling score of carcasses from steers in the MID but not the HIGH treatment. These data demonstrate that RAC increases carcass value in calf-fed Holstein steers by increasing hot carcass weight and ribeye area while having minimal impact on quality grade.

RAC (mg•hd$^{-1}$•d$^{-1}$)

| Item | 0 | 200 | 300 | SE |
|---|---|---|---|---|
| Hot Carcass Weight, kg | 357.5[b] | 362.2[a] | 362.6[a] | 1.43 |
| Dressing Percent, % | 61.2 | 61.2 | 61.4 | 0.49 |
| 12$^{th}$ Rib Fat, cm | 0.66[a] | 0.64[a] | 0.58[b] | 0.03 |
| LM, cm$^2$ | 77.0[b] | 78.8[a] | 79.8[a] | 1.61 |
| Yield Grade | 2.77[a] | 2.71[a] | 2.63[b] | 0.08 |
| Marbling Score[c] | 515[a] | 498[b] | 507[ab] | 20.7 |

[ab]Means differ ($P < 0.05$) [c]Marbling Score:400=slight, 500=small

**Key Words:** Ractopamine, Holstein, Carcass

**170 Dose titration of Optaflexx® (ractopamine HCl) evaluating the effects on growth performance in feedlot heifers.** A. Schroeder*, D. Hancock, D. Mowrey, S. Laudert, G. Vogel, and D. Polser, *Elanco Animal Health*, *Greenfield, IN*.

The effect of feeding Optaflexx®, ractopamine HCl, (RAC), was evaluated at five different geographical sites. A randomized complete block design was used at each site. This resulted in a total of 25 experimental units (7-10 heifers/pen) per Optaflexx concentration. Eight hundred sixty (860) yearling heifers and heifer calves were assigned to one of four treatments (0, 10, 20, 30 ppm, 100% DM). The studies were conducted during different seasons for either 28 or 42 d immediately prior to harvest. Crude protein levels ranged from 13.03 to 15.23% at the various individual study sites. Least square means are given in the following table:

Heifers consumed approximately 0, 94, 189 and 283 mg/hd/d of ractopamine based on an average consumption of 9.42 kg. Feeding RAC did not change feed intake. RAC improved ($P < 0.05$) in ADG, F/G, and G/F for all RAC treatment groups when fed for the last 28 to 42 days of the finishing period. HCW was increased ($P < 0.05$) when RAC was fed at 20 and 30 ppm for the last 28 to 42 days of the finishing period. Dressing percent was not changed in heifers fed RAC. These data demonstrate that RAC, when fed for the last 28 to 42 d of the finishing period, improves growth performance in heifers.

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| Initial weight, kg | 483.85 | 483.31 | 483.22 | 484.26 | 51.65 |
| Final weight, kg | 528.30[b] | 531.34[a] | 534.93[a] | 537.56[a] | 15.83 |
| Daily feed, kg | 9.38 | 9.41 | 9.53 | 9.39 | 0.37 |
| ADG, kg | 1.24[b] | 1.34[a] | 1.46[a] | 1.50[a] | 0.12 |
| Feed/Gain | 7.77[b] | 7.23[a] | 6.68[a] | 6.44[a] | 0.42 |
| Gain/Feed | 0.133[b] | 0.142[a] | 0.153[a] | 0.159[a] | 0.008 |
| HCW, kg | 315.48[b] | 316.29[b] | 318.33[a] | 320.60[a] | 6.49 |
| Dress, percent | 62.2 | 62.0 | 62.0 | 62.1 | 0.70 |

[ab]Means differ ($P < 0.05$)

**Key Words:** Beef, Heifer, Growth, Ractopamine

**171 Dose titration of Optaflexx® (ractopamine HCl) evaluating the effects on standard carcass characteristics in feedlot heifers.** A. Schroeder*, D. Hancock, D. Mowrey, S. Laudert, G. Vogel, and D. Polser, *Elanco Animal Health*, *Greenfield, IN*.

The effect of feeding Optaflexx, ractopamine HCl, (RAC) on standard carcass characteristics in beef heifers was evaluated at five different geographical sites. Heifers were assigned to one of four treatments (0, 10, 20, or 30 ppm, 100% DM). A randomized complete block design was used at each site. This resulted in a total of 25 experimental units (7-10 heifers/pen) per Optaflexx concentration. RAC was fed for the last 28 or 42 days of the finishing period immediately prior to harvest. Harvest was conducted in commercial beef packing plants. Following a 18 to 24 hour chill, carcasses were ribbed and standard carcass measurements collected.

Least square means are given in the following table:

HCW increased, ($P < 0.05$), in the 20 and 30 ppm treatment groups compared to controls. LM area was the largest, ($P < 0.05$), at 30 ppm. Twelfth rib fat thickness and KPH were not affected by RAC treatment. Yield grade tended, ($P = 0.09$), to be improved at 30 ppm. Marbling score and carcass maturity were not affected by RAC treatment. Muscle color was improved, ($P < 0.05$), with RAC treatment. Muscle firmness and texture were not affected by RAC treatments. These data demonstrate that feeding RAC increased HCW at all RAC treatments, and, LM area and conformation scores at 30 ppm RAC, without impacting carcass quality when fed for the last 28 to 42 days of the finishing period.

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| HCW, kg | 315.48[b] | 316.29[b] | 318.33[a] | 320.60[a] | 6.49 |
| 12th rib fat, cm | 1.60 | 1.60 | 1.60 | 1.57 | 0.18 |
| KPH, % | 2.29 | 2.32 | 2.25 | 2.31 | 0.20 |
| LM area, $cm^2$ | 81.27[b] | 81.92[b] | 81.92[b] | 84.5[a] | 2.77 |
| Yield grade | 3.1 | 3.1 | 3.1 | 3.0 | 0.22 |
| Marbling | Sm[34] | Sm[36] | Sm[38] | Sm[30] | 15.5 |
| Maturity | A[56] | A[55] | A[57] | A[55] | 2.1 |
| Conformation | low Ch[77b] | low Ch[69b] | low Ch[86b] | ave Ch[12a] | 0.30 |
| Muscle color[c] | 6.1[b] | 6.2[a] | 6.3[a] | 6.2[a] | 0.20 |
| Muscle firmness[c] | 6.5 | 6.5 | 6.6 | 6.6 | 0.21 |
| Dark cutters, % | 2.3 | 2.8 | 1.9 | 3.3 | |

[ab]Means differ (P < 0.05), [c]scale: 1 = undesirable, 7 = most desirable

**Key Words:** Beef, Heifer, Carcass, Ractopamine

**Least Squares Means**

| Item | RAC (ppm) 0 | 10 | 20 | 30 | SE |
|---|---|---|---|---|---|
| No. Pens | 24 | 25 | 25 | 24 | |
| No. Carcasses | 48 | 49 | 49 | 50 | |
| Side soft tissue, kg | 128.2 | 126.8 | 128.0 | 127.8 | 4.13 |
| Carcass bone, % | 13.84 | 14.04 | 13.91 | 13.95 | 0.26 |
| Protein, % | 14.78[b] | 14.88[b] | 14.94[b] | 15.33[a] | 0.22 |
| Moisture, % | 51.88[b] | 51.69[b] | 51.68[b] | 52.81[a] | 0.86 |
| EEL, % | 32.19[b] | 32.03[b] | 31.95[b] | 30.38[a] | 0.67 |
| Ash, % | 0.81 | 0.79 | 0.81 | 0.84 | 0.02 |
| Carcass protein gain per day, g | 44.5[b] | 45.8[b] | 58.1[a] | 75.8[a] | 27.67 |
| Efficiency of carcass protein gain per day | 0.005[b] | 0.005[b] | 0.006[a] | 0.008[a] | 0.003 |

[ab]Means differ (P <0.05)

**Key Words:** Beef, Heifer, Composition, Ractopamine

**172 Dose titration of Optaflexx® ractopamine HCl) evaluating the effects on composition of carcass soft tissues in feedlot heifers.** A. Schroeder, D. Hancock, D. Mowrey, S. Laudert, G. Vogel, and D. Polser*, *Elanco Animal Health*, *Greenfield, IN*.

The effect of Optaflexx®, ractopamine HCl, (RAC) on the composition of carcass soft tissues (ST) of beef heifers was evaluated at five different geographical sites. A randomized complete block design was used at each site. Heifers were assigned to one of four treatments (0,10,20,or 30 ppm, 100% DM). This resulted in a total of 25 experimental units (7-10 heifers/pen) per Optaflexx concentration. RAC was fed for the last 28 or 42 days of the finishing period immediately prior to harvest. Harvest was conducted in commercial beef packing plants. Up to two carcass sides were randomly selected from carcasses in each experimental unit, which had hot carcass weights (HCW) within ±11.33 kg of the mean HCW in each block. The sides were dissected into ST (muscle and fat), bone (bone and connective tissue) and other tissues (kidney, pelvic, heart fat, diaphram and hanging tender). ST of each side was coarse ground, thoroughly mixed, reground and sub-sampled. Subsamples were homogenized and three aliquots collected and frozen. Moisture, ether extractable lipid (EEL), protein (N x 6.25) and ash content were determined using AOAC methods. Baseline composition on contemporary animals (n=110) was collected upon study initiation to calculate carcass protein gain per day and efficiency of carcass protein gain per day.

Carcass bone and ash were not different between RAC concentrations. Carcass protein and moisture content were increased, (P < 0.05), at 30 ppm RAC compared to controls. EEL was decreased, (P < 0.05), at 30 ppm compared to control. Carcass protein gain per day increased, (P < 0.05), by 30.6% and 70.4% at 20 and 30 ppm RAC concentration, respectively. Efficiency of carcass protein gained per day was improved, (P < 0.05), 20% and 60% at 20 and 30 ppm, respectively. The results indicate feeding RAC at 30 ppm increased carcass protein (leanness) in feedlot heifers when fed for the last 28 to 42 of the finishing phase.

**173 Effects of ractopamine and steroidal implantation on nitrogen retention and blood metabolites in holstein steers.** D. K. Walker*, E. C. Titgemeyer, B. J. Johnson, and J. J. Higgins, *Kansas State University*, *Manhattan*.

Our experiment evaluated interactions between steroidal implantation and feeding ractopamine. Six Holstein steers (231 kg) housed in metabolism crates were used in a split-plot design with the main plot arranged as a randomized complete block design with blocks of two steers based on previous serum IGF-I concentrations. The main plot treatments were implantation or not with 120 mg trenbolone acetate plus 24 mg estradiol-17β (Revalor® S; Intervet) on d 0. The subplot treatment was feeding of 200 mg/d ractopamine-HCl (Optaflexx™; Elanco Animal Health) which was initiated on d 29 and continued through d 56 for all steers. Steers were fed a corn-based diet (62% rolled corn, 20% expeller soybean meal, and 15% alfalfa hay) twice daily with an average DMI of 4.8 kg/d. Urine and fecal samples were collected throughout the study for measuring N retention. Blood samples were collected prior to implantation and on d 14, 28, 42, and 56. There was an implant × ractopamine interaction for retained N (P<0.05); ractopamine feeding led to only a minor improvement in N balance for implanted steers (45.9 vs. 44.5 g/d), whereas ractopamine led to large increases in N balance for non-implanted steers (39.0 vs. 30.4 g/d). Fecal N output was significantly lower (P<0.01) and DM digestibility was higher (79.6 vs. 77.3%; P<0.01) when ractopamine was fed. Implantation increased (P<0.05) serum IGF-I concentration on d 14 (526 vs. 444 ng/mL) and on d 28 (659 vs. 442 ng/mL), and IGF-I remained greater for implanted steers when ractopamine was fed (545 vs. 359 ng/mL; average of d 42 and 56). Both ractopamine and implantation numerically decreased plasma glucose and urea. Ractopamine decreased serum insulin 8% in non-implanted steers (0.50 vs. 0.46 ng/mL), but decreased it 66% in implanted steers (0.40 vs. 0.14 ng/mL). The steroidal implant and the feeding of ractopamine both increased N retention in steers, but the combination did not yield an additive response.

**Key Words:** Cattle, Implant, Ractopamine

**174 Using ultrasound measurements to determine body composition of yearling bulls.** M. Baker*[1], L. Tedeschi[1], D. Fox[1], W. Henning[2], and D. Ketchen[1], [1]*Cornell University*, *Ithaca, NY*, [2]*Penn State University*, *Statel College*.

Carcass traits have been successfully used to determine body composition of steers to allocate feed to individual animals fed in groups. In this study, the individual DM required for the observed performance of yearling bulls was assessed using ultrasound measurements as a proxy for carcass traits. One hundred eighteen spring born purebred and crossbred bulls (BW = 288 46 kg) were

sorted into three marketing groups based on projected days to USDA low Choice quality grade and fed a common high concentrate diet in twelve slatted-floor pens (10 head per pen). Ultrasound measurements (backfat (uBF), rump fat (uRmpFt), ribeye area (uREA), and intramuscular fat (IMF)), were taken at approximately one year of age. At the projected days to finish, each marketing group was harvested in a commercial packing facility. Carcass data (HCW, backfat over the 12-13th rib (BF), marbling score (MRB), and ribeye area (REA)) was collected for comparison with ultrasound data. The 9-10-11th rib section was removed and dissected into edible and non-edible portions. Chemical fat was determined by ether extract of the edible portion and used to compute carcass fat (CF) and empty body fat (EBF). The observed EBF averaged 23.7%. Multiple regression analysis indicated that carcass measurements explained 73% of the variation in EBF (EBF = 16.0583 + 5.6352*BF + 0.01781* HCW + 1.0486*MRB - 0.1239*REA). Because carcass traits are not available on bulls intended for breeding, another equation using computed HCW (cHCW; using a previously published equation between HCW and SBW) and ultrasound measurements was developed (EBF = 41.0437*uBF - 0.1384*uREA + 0.0867*cHCW - 0.0897*uBF*cHCW - 2.4225). This equation accounted for 62% of the variation in EBF. An equation previously developed to estimate EBF from carcass traits of steers over predicted the observed EBF of these bulls (28.2 vs. 23.7%, respectively). Carcass traits are sufficient to estimate EBF in yearling bulls, but further investigation is required to improve equations for EBF using ultrasound measures.±

**Key Words:** Beef bulls, Ultrasound, Body Composition

# Meat Science and Muscle Biology: Novel Technologies in Muscle Biology/Fresh Meat Research

**175 Adipocytes, myofibers, and cytokine biology: New horizons in the regulation of growth and body composition.** M. Spurlock*, S. Jacobi, J. Davis, N. Gabler, and K. Ajuwon, *Purdue University*, *West Lafayette, IN*.

Muscle growth in meat animals is a complex process governed by integrated signals emanating from multiple endocrine and immune cells. A generalized phenomenon among meat animal industries is that animals commonly fail to meet their genetic potential for growth in commercial production settings. Therefore, understanding the impact of stress and disease on muscle growth potential is essential to improving production efficiency. The adipocyte in particular seems to be well positioned as an interface between energy status and immune function, and may thus regulate myofiber growth through a combination of signals which influence fatty acid oxidation, glucose uptake and insulin sensitivity. Adipocytes are active participants in the innate immune response, and as such, produce a number of metabolic regulators, including leptin, adiponectin, and proinflammatory cytokines. Specifically, adipocytes respond directly to bacterial lipopolysaccharide by producing IL-6 and TNFÎ±. However, adipocytes are also the sole source of the anti-inflammatory hormone, adiponectin, which regulates the nuclear factor kappa-B transcription factor, locally, and in myofibers. The production of such molecules strategically positions inter- and intra-muscular adipocytes to act as immunological sensors to regulate direct and indirect responses of myofibers to inflammatory signals. In this talk, we will establish critical immunological aspects of the adipocyte, and build specific linkages between these processes, cytokine production, and energy metabolism at the myofiber and whole-animal level. Finally, specific research needs will be emphasized.

**Key Words:** Adipocyte, Myofiber, Cytokine

**176 Gene expression profiling: Insights into skeletal muscle growth and development.** D. Moody, C. Stahl, and J. Reecy*, *Iowa State University*, *Ames*.

It has been appreciated for a long time that skeletal muscle has an incredible ability to adapt to the genetic and physiological demands placed upon it. However, it has only been with the advent of high-throughput gene expression analysis that a systems-based understanding of these adaptations has begun to be appreciated. For example, compensatory growth in response to an imposed load is an important and well-known biological adaptation of skeletal muscle. Skeletal muscle hypertrophy results in increased amino acid transport, satellite cell proliferation, protein accretion, and involves fiber-type switching. However, we are only beginning to understand the systemic changes in hypertrophying muscle at the molecular level. An initial gene expression profiling experiment of work overloaded skeletal muscle has led us to describe the requirement for JAK2 signaling in myoblast proliferation and differentiation. In addition, gene expression profiling has also led to the discovery of new gene families associated with muscle hypertrophy. For example, gene expression analysis of skeletal muscle following administration of the beta-adrenergic receptor agonist clenbuterol revealed a significant decrease in RNA abundance of multiple members of the novel ankyrin repeat and SOCS-box containing (ASB) gene family. Furthermore, while the need of dietary P for both soft-tissue and bone growth has been well documented, the mechanisms by which this nutrient is involved in regulating growth has only begun to be elucidated. Current research is focused on identifying these mechanisms as well as nutrition by genetic interactions, which may affect them. These results provide new information concerning changes in gene expression associated with skeletal muscle growth and development, and provide candidate genes for future hypothesis-based testing.

**Key Words:** Microarray, Genetic, Nutrition

**177 Use of transgenic mouse models to understand proteolytic degradation systems in muscle.** M. Spencer*, *University of California*, *Los Angeles*.

Investigations into mechanisms involved in muscle wasting and growth have traditionally relied on the use of inhibitors against the different proteolytic systems present in muscle. These studies, while informative, do not always provide specific information about the role of individual proteases within a class or about the contribution of different family members. Genetically modified mice, in which genes are either knocked out or overexpressed are useful tools to circumvent these problems. We have generated several lines of genetically modified mice and have used them to address questions of muscle wasting, remodeling and disease. Mice lacking (knock out) or overexpressing (transgenic) proteins of the calpain and ubiquitin ligase families are generated, characterized and then subjected to perturbations that elicit muscle wasting. These studies have shown that calpains act upstream of ubiquitin ligases in the processes of muscle wasting and growth.

**Key Words:** Calpain, Ubiquitin, Muscle Growth

**178 Application of proteomics in meat research.** R. Lametsch*, *The Royal Veterinary and Agricultural University, Department of Food Science*, *Frederiksberg, Denmark*.

The large progress in biotechnology in recent years has resulted in the development of new scientific research areas such as genomics and proteomics, which are used to study the complex patterns of gene and protein expression in cells and tissue. The technologies developed within genomics and proteomics have mainly been used in life science, e.g. to develop new drugs and diagnostic tools. However, they also have a large potential in food science as gene expression and protein composition of plants and animals have a major impact on the yield and quality of the final food products. Proteomics is the study of the proteome which is defined as the protein complement expressed by the genome of an organism.