



## The Effect of Chromium Propionate on Carcass Characteristics

As the world's population increases and as countries become more economically developed, it is important U.S. beef producers are capable of providing more total pounds of lean beef and high quality beef products<sup>4</sup>. Sufficient amounts of intramuscular fat (IMF), also referred to as marbling, are crucial for beef tenderness, juiciness and flavor. Research has shown intramuscular fat content increases with increasing days on feed but plateaus as time is increased<sup>4</sup>. As cattle are fed longer, there needs to be new ways of influencing the growth of intramuscular fat throughout the feeding period.

Research conducted by Smith and Crouse (1984) demonstrated for intramuscular adipose tissue development, glucose contributes a greater proportion of acetyl units to fatty acid biosynthesis than in subcutaneous adipose tissue<sup>4</sup>. In intramuscular adipose tissue, glucose contributes approximately 70% of the acetyl units to fatty acid biosynthesis; whereas, acetate and lactate contributed less than 20% of the acetyl units.

Chromium propionate is a highly bioavailable source of chromium that allows cattle to utilize energy more efficiently. The primary role of chromium is to potentiate the action of insulin; **increased insulin activity promotes intracellular glucose uptake, providing more efficient energy utilization.**

Carcass weight is the most important factor in determining carcass value when cattle are sold. Regardless of how cattle are marketed, on a dressed-weight basis or a value-based grid, carcass value is always tied to the carcass weight. In many cases, a heavier-weight carcass may have a greater total value than a lighter weight carcass because of the difference in total pounds, even if the lighter carcass is more valuable on a per-pound basis<sup>5</sup>.

- **Research has shown supplementing 300 ppb of chromium caused an increase in carcass weight (9.1 Kg or 20.2 lb;  $P < 0.01$ ) and a slight increase in rib fat depth (0.13 cm;  $P < 0.05$ )<sup>2</sup>.**

Ribeye area (REA) is an indicator of the amount of lean muscle associated with a carcass. As the REA increases, the amount of muscle in a carcass increases, an important factor in the determination of Yield Grade. As the ribeye area increases, Yield Grade tends to improve. REA is determined by measuring the area of the longissimus dorsi (ribeye) muscle exposed by cutting or "ribbing" the carcass between the 12th and 13th rib<sup>5</sup>.

- **Research has shown chromium increased LM (longissimus muscle) area by 6.8% ( $P < 0.01$ )<sup>3</sup>.**

Fat thickness (rib fat or back fat) is a measure of external fat thickness on a carcass. External fat is the most important determinant of retail yield. As fat thickness increases, cutability and percentage of retail product decrease, resulting in less desirable Yield Grades<sup>5</sup>.

- **Research has shown chromium tended to increase retail yield by 1.6% ( $P = 0.07$ ) and decrease carcass fat thickness by 10% ( $P = 0.09$ )<sup>3</sup>.**

Research conducted at Texas Tech University investigated the effects of chromium propionate on enhancing the adipogenic differentiation of bovine muscle-derived cells and intramuscular (IM) and subcutaneous (SC) adipocytes which is shown in Figures 1 and 2. The research shows chromium propionate:

- Has a positive effect on AMPK- $\alpha$ ;
- Has a positive effect on PPAR $\gamma$  and Glut4 protein in IM preadipocytes, skeletal muscle hypertrophy (size of myotubes) and differentiation (extent and number of myotubes).<sup>1</sup>

**This data suggests opportunities to potentially augment marbling and carcass characteristics in beef cattle fed chromium propionate<sup>1</sup>.**

Figure 1. Effect of CrPro on enhancing adipogenic differentiation of intramuscular and subcutaneous adipocytes<sup>1</sup>

Adipocytes	Intramuscular	Subcutaneous
AMPK- $\alpha$	+	-
GLUT-4	+	-
PPAR- $\gamma$	+	-
Lipid Droplets	↑↑	↑-

Figure 2. Effect of CrPro on enhancing adipogenic differentiation of muscle cells<sup>1</sup>

Muscle Cells	
Chromium	Increase myotube size ↑
Chromium	Number of myotubes ↑
GLUT-4	No Change
GLUT-4/GAPDH	↓

While many factors affect carcass quality, chromium has been shown to have a positive effect on live performance<sup>1</sup> and also influence many of key characteristics that determine the overall carcass value<sup>1,2,3</sup>. At today's carcass prices, investing in chromium propionate is a favorable choice in returning a significant profit.

## References

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