INTRODUCTION

Previous research has demonstrated that beef tenderness is improved by marination with calcium chloride. Despite the improvement in tenderness, calcium chloride is known to induce bitter, metallic, and livery off-flavors and also accelerate color deterioration during display. Thus, the need exists for ingredient technology that will take advantage of calcium activated tenderization without causing detrimental flavor or color effects.

OBJECTIVE

Compare the effects of injection marination with calcium ascorbate, calcium lactate, or calcium chloride on beef *longissimus* color life, shear and sensory traits, lipid oxidation, and microbial inhibition.

METHODS

- At 40 hours postmortem, USDA Select beef strip loins were injected (11% by weight) with:
  - 0.1, 0.2, or 0.3M calcium ascorbate, calcium chloride, or calcium lactate; Non-marinated loins served as controls.
- Loins were aged 12 days before being processed into steaks.
- Simulated retail display steaks were packaged on white foam trays, overwrapped with PVC film, and displayed for 5 days at 3°C. Visual and instrumental (L*a*b*) color were evaluated and chroma was calculated.
- Shear force and sensory panel steaks were cooked on a MagiKitch’n electric belt grill set at 117°C to an internal temperature of 71°C.
- TBARS and total aerobic plate counts were evaluated after 96 hours of display.
- Design structure = incomplete block design; loin = blocking factor; one-third loin = experimental unit. The statistical model included the fixed effect of marination treatment, and the random effect of loin. Single degree of freedom contrasts were used to test the main effects of calcium salt and molar concentration.

### RESULTS

- All calcium salts equally induced tenderization.
- Calcium ascorbate increased myoglobin oxidation and significantly reduced color life, yet inhibited lipid oxidation.
- Calcium chloride and ascorbate resulted in less beef flavor and more off-flavors than calcium lactate.
- Calcium lactate inhibited microbial growth during simulated display.
- Increasing molar concentration improved tenderization and pumped yields, but decreased color life and increased off-flavors.

### CONCLUSION

**TO IMPROVE BEEF LONGISSIMUS TENDERNESS WITHOUT CAUSING DETERIMENTAL COLOR OR FLAVOR EFFECTS, WE RECOMMEND USING A 10% PUMP OF 0.1M CALCIUM LACTATE**