



## Evaluation of Beef Steak Exudate Differing in Quality Grade and Post-Mortem Aging Time

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### Objectives

Evaluate absorbance and metabolite differences of beef exudate from raw beef steaks differing in quality grade and post-mortem aging time.

### Materials and Methods

USDA Select (SE;  $n = 18$ ) and USDA Choice (CH;  $n = 18$ ) beef strip loins were aged for 7d, cut into 2.54 cm thick steaks, and randomly assigned a post-mortem aging duration of either 10 or 20d post-mortem ( $n = 72$  total). Steaks were individually packaged on d7 and frozen on the assigned day at  $-20^{\circ}\text{C}$  until time for analysis. Steaks were thawed for 24h at  $4^{\circ}\text{C}$  before 2 mL of exudate was collected from each bag on removal of the steak. The exudate was frozen at  $-80^{\circ}\text{C}$  until further analysis. For analysis of absorbance, 0.5 mL of thawed exudate was diluted with 4.5 mL ultra-pure water and centrifuged. Then, 200  $\mu\text{L}$  of the dilution was pipetted in triplicated onto a 96 well plate. Absorbance was read at a range of 350–700nm wavelengths. A dilution of 1:20 beef exudate: ultra-pure water was filtered and used for metabolite analysis. Using a HILIC column, 5  $\mu\text{L}$  were injected into an organic mobile phase gradient and analyzed using an Agilent 6545 LC/MS-QTOF in positive mode. Data were analyzed using a two-factorial design with quality grade and post-mortem day of aging as fixed

effects with an  $\alpha$  of 0.05. Loin was included as a random effect. Least squares means, correlations, and principal component analysis were used to discriminate data.

### Results

CH exudate had greater ( $P < 0.05$ ) absorbance than SE at wavelength ranges of 350–404, 423–467, and 491–508 nm. For the range of 350–598nm, CH exudate tended ( $P < 0.10$ ) to have a greater absorbance than SE exudate. No differences ( $P > 0.05$ ) were detected at all other wavelengths analyzed between quality grade. Post-mortem aging had no effect ( $P > 0.05$ ) on wavelength absorbance. Of the total metabolites present ( $n = 33$ ) in the samples, no differences ( $P > 0.05$ ) were observed among fixed effects. Only three metabolites exhibited a twofold change in expression, observed as a downregulation from SE to CH exudate. With age, nearly two-thirds of the metabolites ( $n = 19$ ) tended to increase in intensity. Tritriacontyl octacosanoate was unique to SE exudates.

### Conclusion

Beef exudate tends to be influenced by quality grade more than post-mortem aging duration. Accordingly, exudate samples from raw steaks may be classified by quality grade no matter the duration of aging time.