Understanding Factors Affecting Meat Quality

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Results from Pasture Based Beef Systems for Appalachia

Multi-State, Multi-Institutional Research Collaboration
Pasture-Based Beef Systems for Appalachia (Experiment 1)

- 3 yr study, cattle harvested in 2002-2004, 198 hd total
- 3 winter stocker treatments
  - Low (0.5 lb/d), Med (0.99 lb/d), High (1.50 lb/d)
  - Hay, SBM, SBH at varying levels
  - 98, 95, 91% lifetime intake from pasture or hay
- 2 finishing treatments
  - Concentrate or Pasture finished, 150 d
  - Slaughtered at a constant age endpoint
- 107 rib removed
  - Rib dissection
  - Chemical analyses
  - Palatability

Pasture-Based Beef Systems for Appalachia (Experiment 2)

- 3 yr study, cattle harvested in 2005-2007, 132 total
- Winter stocker period - Stockpiled fescue, alfalfa hay and haylage
- Finishing treatments
  - Forage treatments
    - 0 - 108 d: Mixed Pasture (MP)
    - 109 – 150 d: MP, Alfalfa (AL), Pearl Millet (PM)
    - 100% of lifetime production on forages
  - 0 – 150 d: finished on concentrates (CONC)
- 107 rib removed
  - Rib dissection
  - Chemical analyses
  - Palatability
Expt. 1: CONC = 83% Choice, PAST = 70% Select, 22% Standard, 6% Choice
Expt. 2: CONC = 91% Choice, PAST = 59% Select, 37% Standard, 4% Choice
**Total Lipid Content of LM**

Expt. 1: CONC = 83% Choice, PAST = 70% Select, 22% Standard, 6% Choice
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**Total Protein Content**

Expt. 1: CONC = 83% Choice, PAST = 70% Select, 22% Standard, 6% Choice
Expt. 2: CONC = 91% Choice, PAST = 59% Select, 37% Standard, 4% Choice
Cholesterol Content

Vitamin E (alpha-tocopherol)
Total Fat per serving: Beef vs. Others

Hypercholesterolemic SFA
PUFA 3: Beef vs. Others

<table>
<thead>
<tr>
<th></th>
<th>mg/3 oz. serving broiled</th>
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<tbody>
<tr>
<td>Grain-fed beef</td>
<td>33</td>
</tr>
<tr>
<td>Grass-fed beef</td>
<td>55</td>
</tr>
<tr>
<td>Chicken breast, skinless</td>
<td>15</td>
</tr>
<tr>
<td>Chicken breast, natural</td>
<td>26</td>
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<tr>
<td>Chicken thigh</td>
<td>64</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>mg/3 oz. serving broiled</th>
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</thead>
<tbody>
<tr>
<td>Salmon, farmed</td>
<td>940</td>
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<tr>
<td>Salmon, wild</td>
<td>863</td>
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</tbody>
</table>

CLA and TVA

*Assuming 19% conversion of TVA to CLA
Health professionals recommend ratio of 4:1 or less

Omega-3 Levels

- Health professionals recommend diets with ratio of less than 4:1
- Lyon Heart Study
  - Dietary intervention study in patients after 1st myocardial infarction; reduced linoleic to linolenic ratio to 4:1
  - 76% decrease in mortality after 2 yrs on intervention diet
- Source of omega-3, Australian diet
  - Red meat supplied over 70% of total dietary DPA
Descriptive Flavor Panel

Flavor Mean Intensity Tables
A = Alfalfa, F = Concentrate, C; N = Mixed pasture, MP; PM = Pearl Millet

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Beef Flavor ID</th>
<th>Brown Roasted</th>
<th>Bloody/Serumy</th>
<th>Metallic</th>
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<tbody>
<tr>
<td>A</td>
<td>10.30 b</td>
<td>11.61 a</td>
<td>2.98 a</td>
<td>2.98 a</td>
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<tr>
<td>F</td>
<td>11.12 a</td>
<td>11.68 a</td>
<td>2.94 a</td>
<td>2.94 a</td>
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<tr>
<td>N</td>
<td>9.99 b</td>
<td>11.61 a</td>
<td>2.85 a</td>
<td>2.85 a</td>
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<tr>
<td>PM</td>
<td>10.38 b</td>
<td>11.65 a</td>
<td>2.91 a</td>
<td>2.91 a</td>
</tr>
</tbody>
</table>

P-value 0.00 0.97 0.01 0.01 0.45

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rancid</th>
<th>Off-Note</th>
<th>Sour</th>
<th>Salty</th>
<th>Bitter</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>0.13 a</td>
<td>0.71 a</td>
<td>2.11 a</td>
<td>1.64 a</td>
<td>2.68 ab</td>
</tr>
<tr>
<td>F</td>
<td>0.08 a</td>
<td>0.18 b</td>
<td>2.01 b</td>
<td>1.77 a</td>
<td>2.54 b</td>
</tr>
<tr>
<td>N</td>
<td>0.13 a</td>
<td>0.77 a</td>
<td>2.14 a</td>
<td>1.63 a</td>
<td>2.74 a</td>
</tr>
<tr>
<td>PM</td>
<td>0.13 a</td>
<td>0.57 ab</td>
<td>2.10 ab</td>
<td>1.62 a</td>
<td>2.67 ab</td>
</tr>
</tbody>
</table>

P-value 0.93 0.02 0.05 0.36 0.20

1 a, b: Means with the same letter within a column are not significantly different at the 95% Confidence Level
1 Means based on 15-point scale with 0.5-increments. 0.0 = none – 15.0 = extreme

Warner-Bratzler Shear Force

Expt. 1: CONC = 83% Choice, PAST = 70% Select, 22% Standard, 6% Choice
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Current Research - Heifers

Fresh and Frozen Ground Beef Shelf-Life

Animal Age at Slaughter

• Cattle harvest in 2008 (2009 in progress)
• Medium or Large frame sires; 3 time endpoints
  (1=July 17, 2=Sept. 3, 3=Oct. 30, 2008)
Expanding the Grazing Season for Sustainable Year-Round Forage-Finished Beef Production

60 Angus x Simmental cross steers
2 yr study
5 forage treatments
Bermudagrass
Chicory
Cowpea
Alfalfa
Pearl Millet

Average Daily Gains
Hot Carcass Weight

Postmortem Aging
Warner-Bratzler Shear Force, d 14

Consumer Panel
Summary

• Grass-fed Beef
  – Lighter carcass weights, less carcass fat
  – Leaner with less total hypercholesterolemic fat
  – Increased omega-3 and CLA contents
  – Increased antioxidant content
  – No difference in palatability
    • Possible benefit from finishing on legumes

• Lambs
  – Increased weight gain with Chicory
  – Higher FAMACHA scores and lower fecal egg counts
Canned Tomatoes

The Problem: 

The fad dieting of the last several years has been linked to a variety of health problems ranging from reproductive disorders to heart disease, diabetes, and obesity. Unfortunately, many of these problems are caused by the processing of canned tomatoes.

The Solution: 

Choose organic tomatoes in glass bottles, which are free from BPA. Avoid the brand Rajam (B7). You can also get organic tomatoes in glass jars from Trader Joe's, like their Organic Tomato Juice.

Corn-Fed Beef

The Problem: 

Corn-fed beef is higher in saturated fat and lower in unsaturated fats than grass-fed beef, which is not only bad for your wellness but also for the animals. Grass-fed beef is grassed in the spring, summer, and fall, while corn-fed beef is fed all year round. This makes corn-fed beef less healthy for you and the animals.

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7 Foods You Should Never Cross Your Lips

BUDGET TIP: You can save money on fresh tomatoes by making your own. Look for low-sodium canned tomatoes, or you may have to use canned tomatoes in some recipes.

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