

Understanding Factors Affecting Meat Quality



Susan K. Duckett

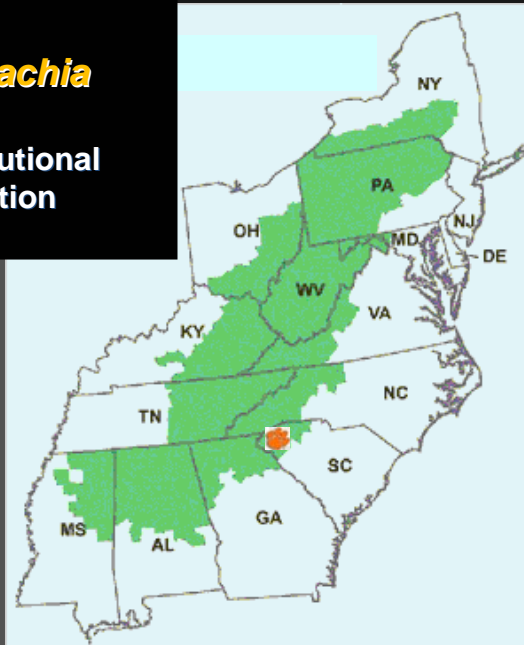
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Results from Pasture Based Beef Systems for Appalachia

Multi-State, Multi-Institutional Research Collaboration

United States Department of Agriculture
Agricultural Research Service



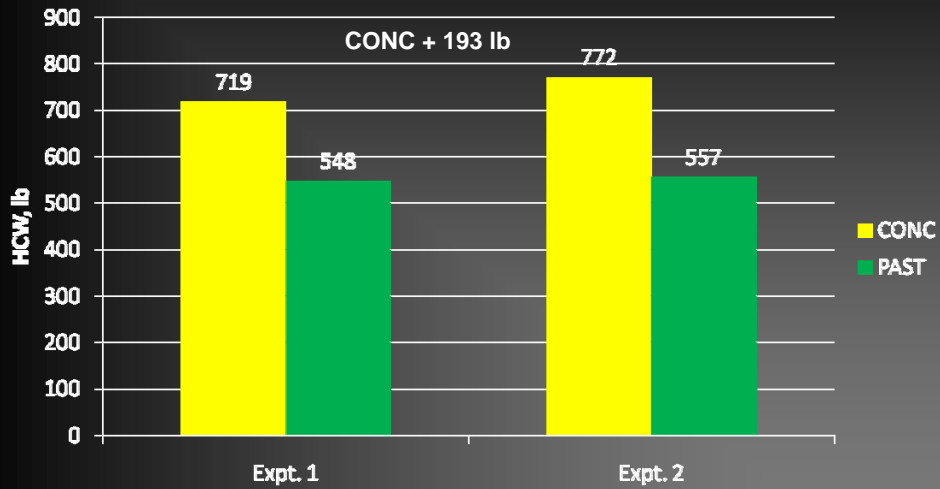
Pasture-Based Beef Systems for Appalachia (Experiment 1)

- 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)

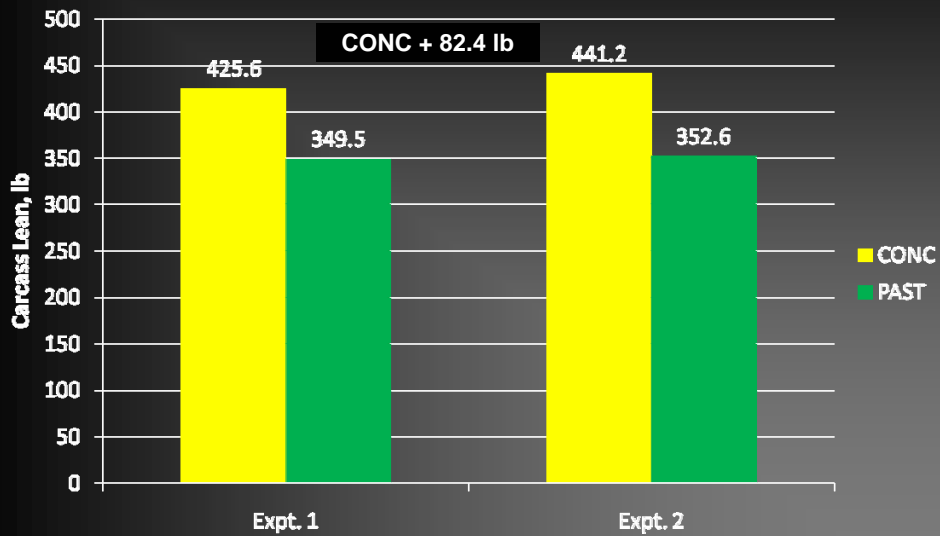
- 3 yr study, cattle harvested in 2005-2007, 132 total
- Winter stocker period - Stockpiled fescue, alfalfa hay and haylage
- Finishing treatments
 - Forage treatments
 - 0 - 108 d: Mixed Pasture (MP)
 - 109 – 150 d: MP, Alfalfa (AL), Pearl Millet (PM)
 - 100% of lifetime production on forages
 - 0 – 150 d: finished on concentrates (CONC)
- 107 rib removed
 - Rib dissection
 - Chemical analyses
 - Palatability

Hot Carcass Weight

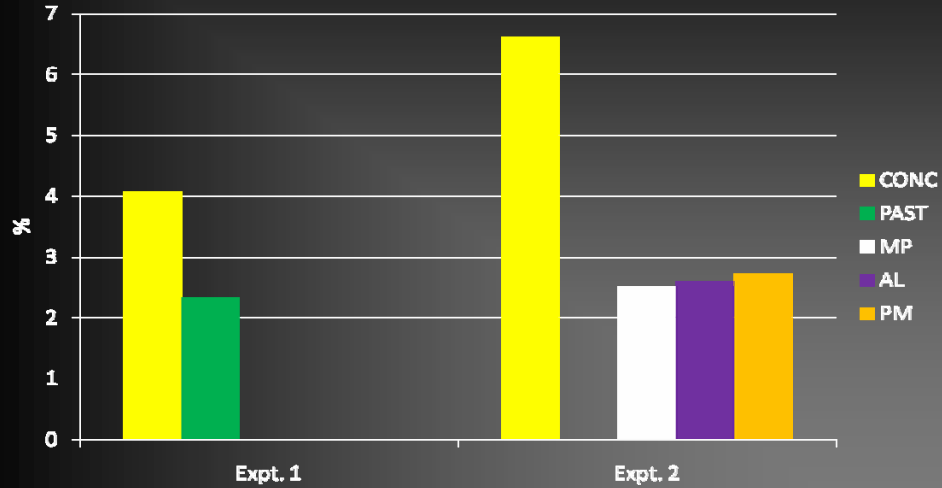


Expt. 1: CONC = 83% Choice, PAST = 70% Select, 22% Standard, 6% Choice
Expt. 2: CONC = 91% Choice, PAST = 59% Select, 37% Standard, 4% Choice

Predicted Carcass Lean

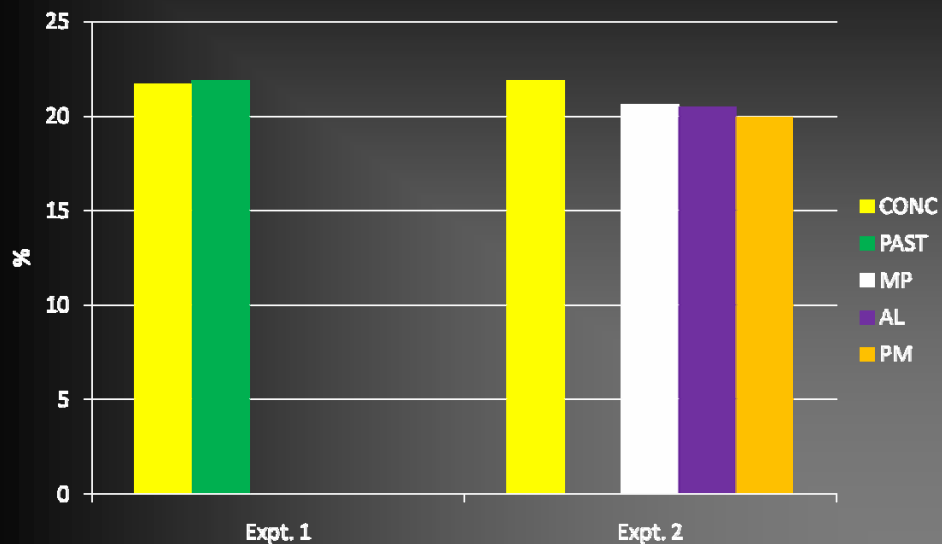


Total Lipid Content of LM

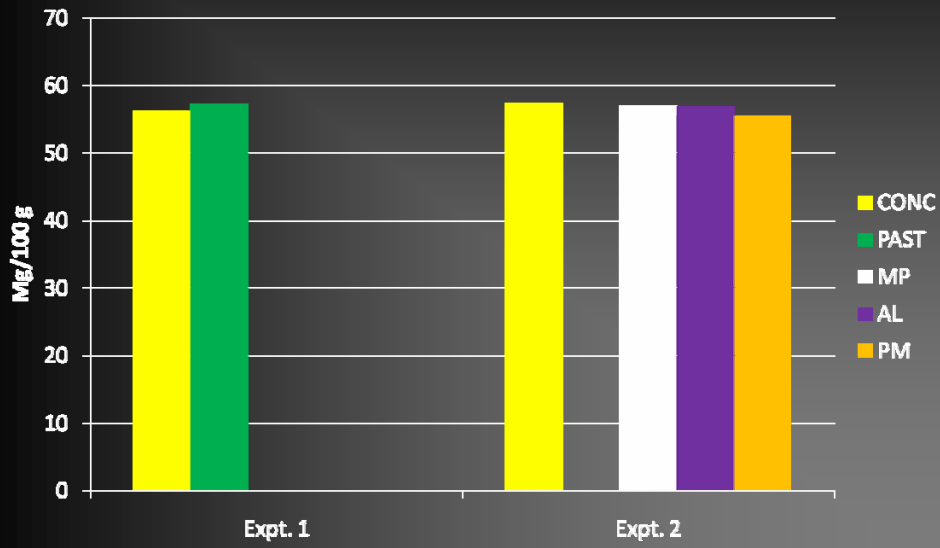


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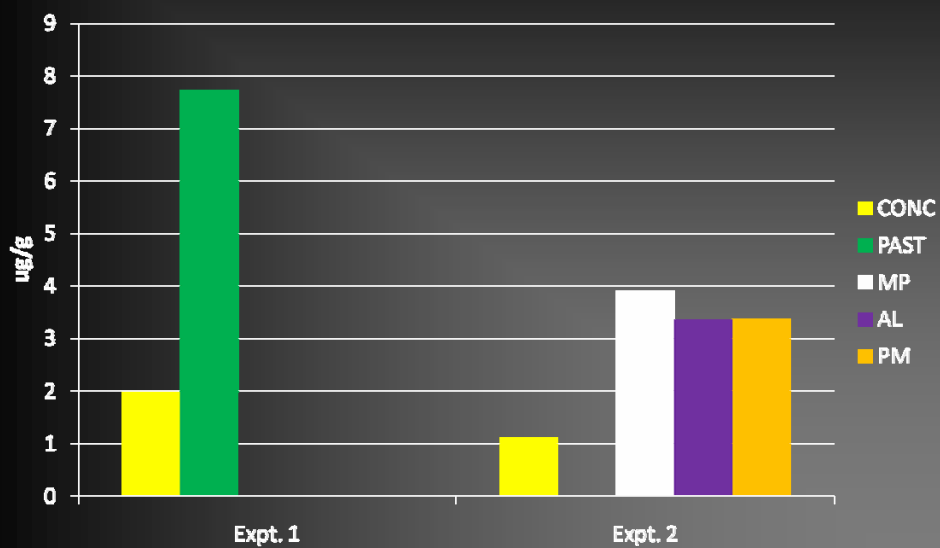
Total Protein Content



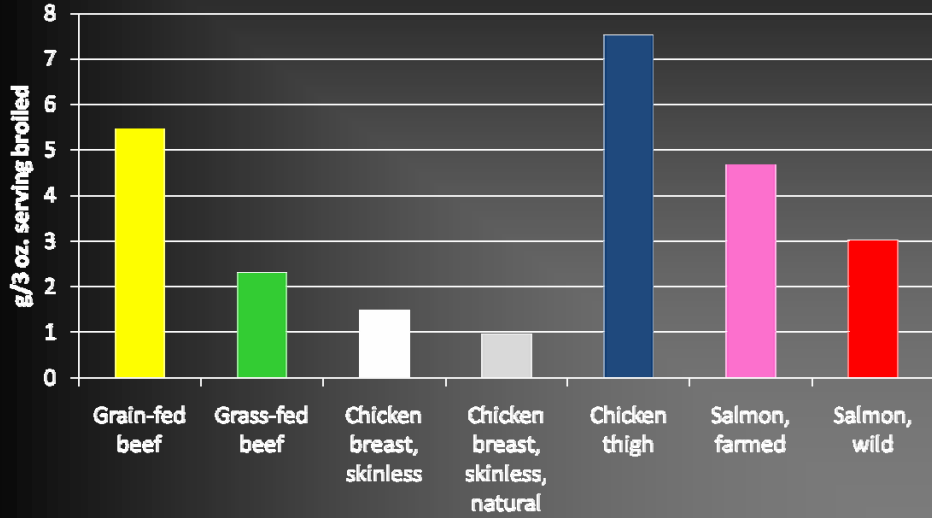
Cholesterol Content



Vitamin E (alpha-tocopherol)

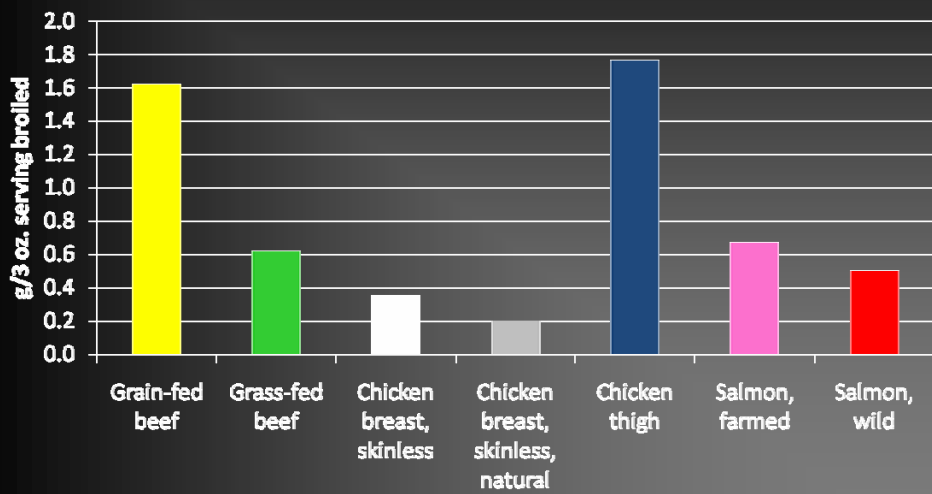


Total Fat per serving: Beef vs. Others

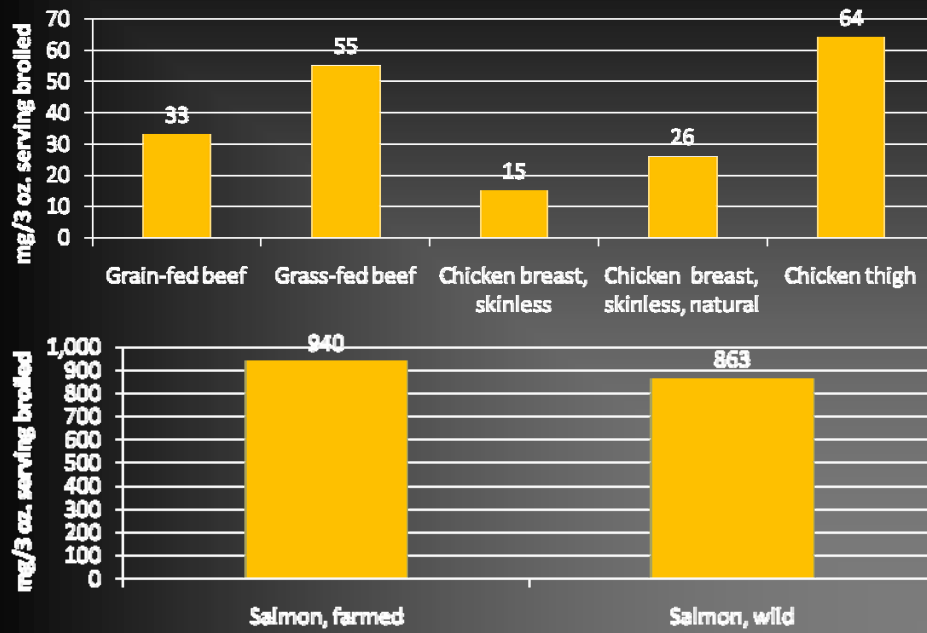


Hypercholesterolemic SFA

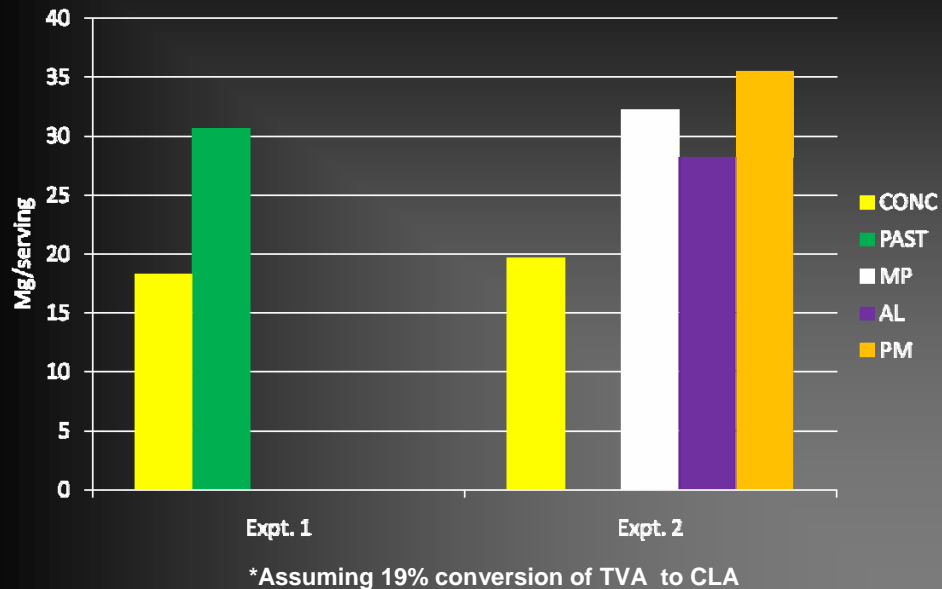
SFA- BAD



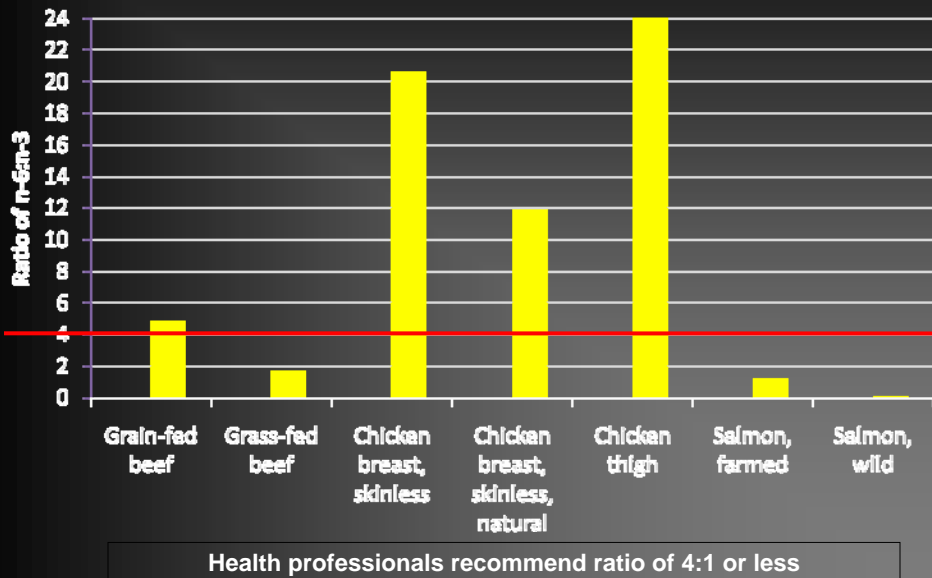
PUFA 3: Beef vs. Others



CLA and TVA



Ratio of Omega-6 to Omega-3



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 infraction; 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 Tables¹

A = Alfalfa; F = Concentrate, C; N = Mixed pasture, MP; PM = Pearl Millet

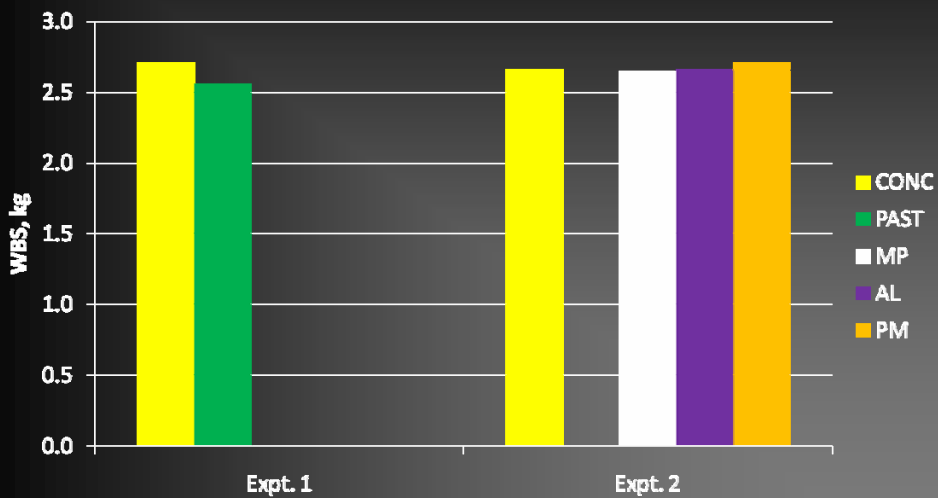
Treatment	Beef Flavor ID	Brown Roasted	Organ Meat	Bloody/Serumy	Metallic
A	10.30 b	11.61 a	0.12 b	2.98 a	2.98 a
F	11.12 a	11.68 a	0.07 b	2.94 a	2.94 a
N	9.99 b	11.61 a	0.31 a	2.85 a	2.85 a
PM	10.38 b	11.65 a	0.08 b	2.91 a	2.91 a
P-value	0.00	0.97	0.01	0.01	0.45

Treatment	Rancid	Off-Note	Sour	Salty	Bitter
A	0.13 a	0.71 a	2.11 a	1.64 a	2.68 ab
F	0.08 a	0.18 b	2.01 b	1.77 a	2.54 b
N	0.13 a	0.77 a	2.14 a	1.63 a	2.74 a
PM	0.13 a	0.57 ab	2.10 ab	1.62 a	2.67 ab
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

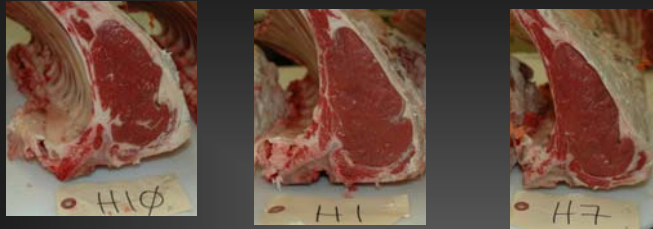
¹ Means based on 15-point scale with 0.5-increments. 0.0 = none -- 15.0 = extreme

Warner-Bratzler Shear Force



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Current Research - Heifers

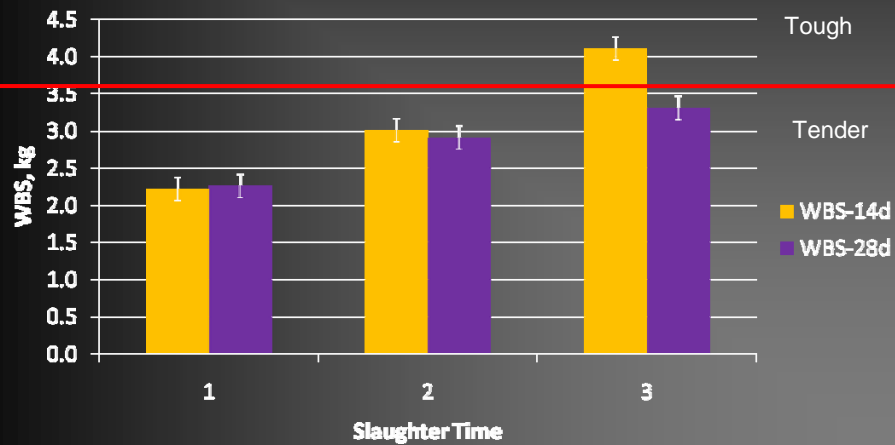


Fresh and Frozen Ground Beef Shelf-Life



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)



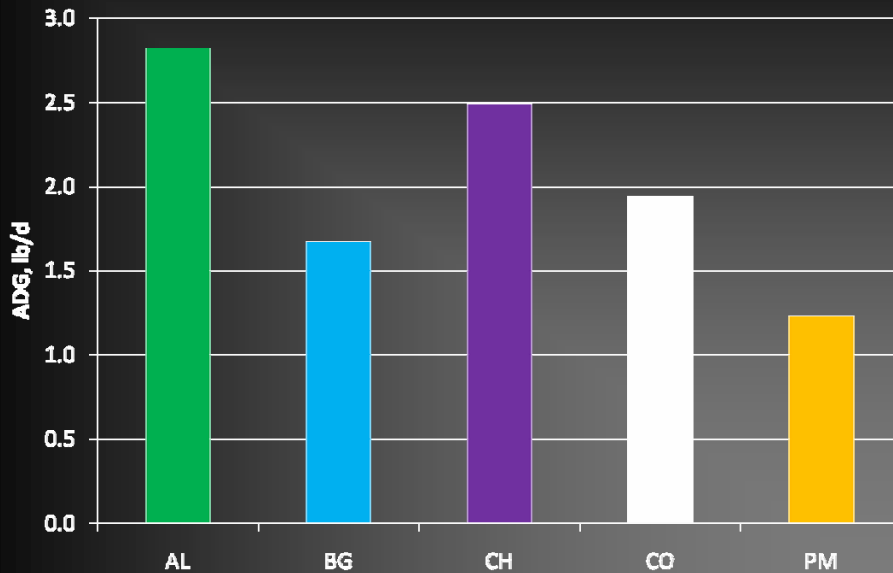


Expanding the Grazing Season for Sustainable Year-Round Forage-Finished Beef Production

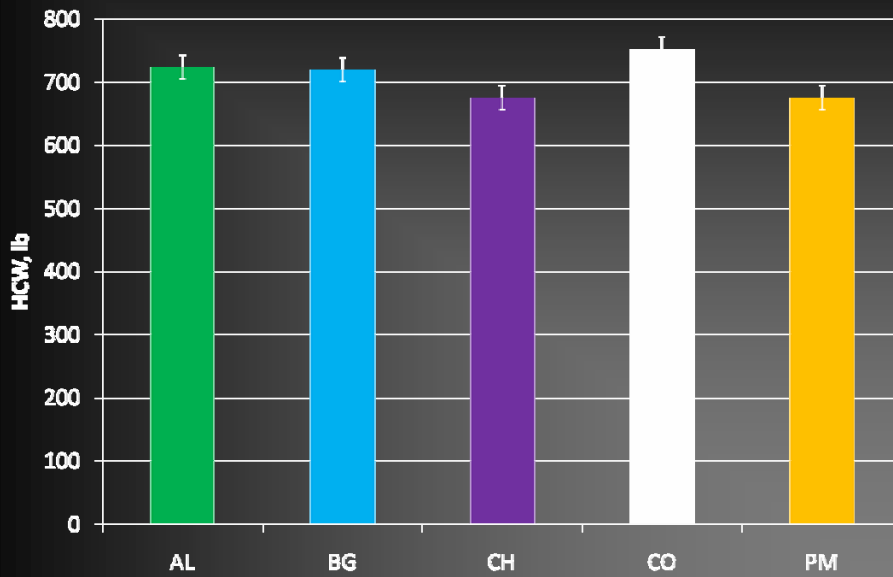
60 Angus x Simmental cross steers
2 yr study
5 forage treatments
Bermudagrass
Chicory
Cowpea
Alfalfa
Pearl Millet



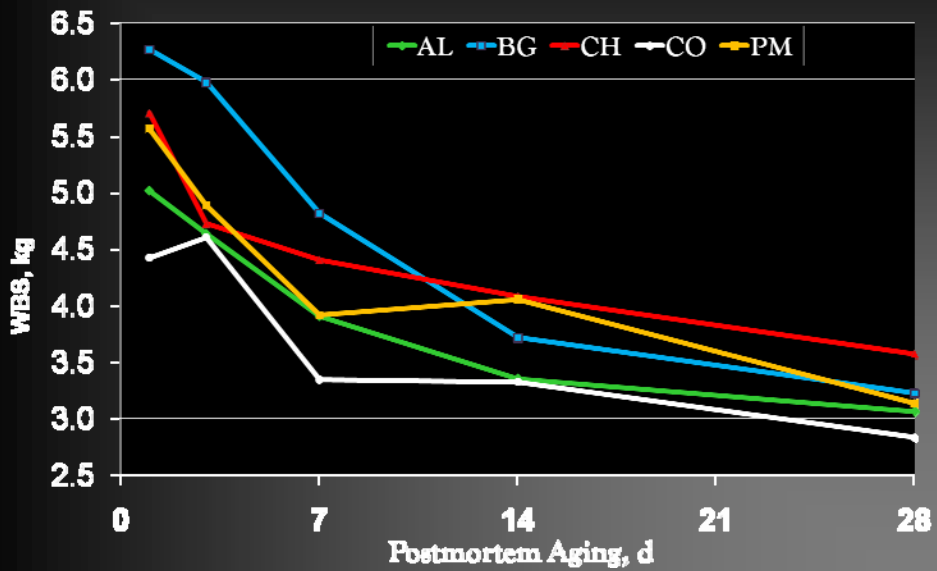
Average Daily Gains



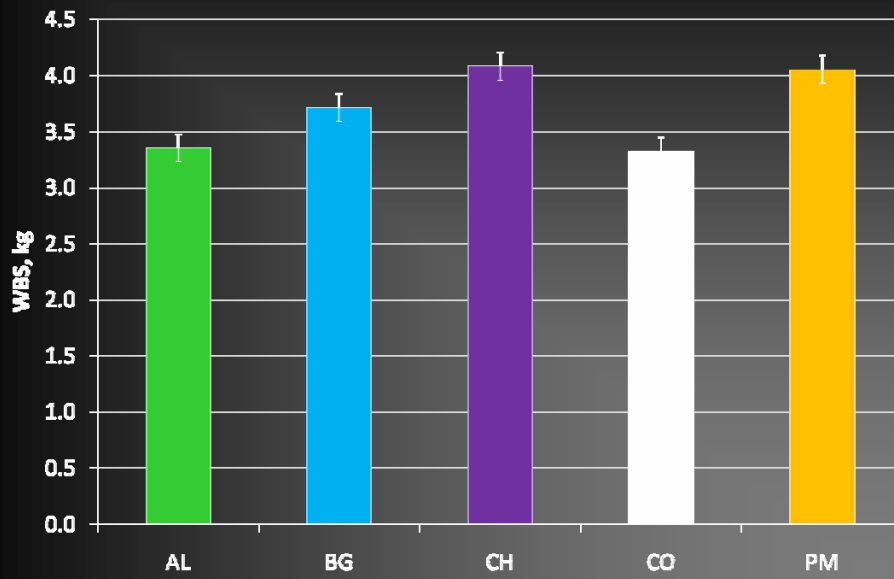
Hot Carcass Weight



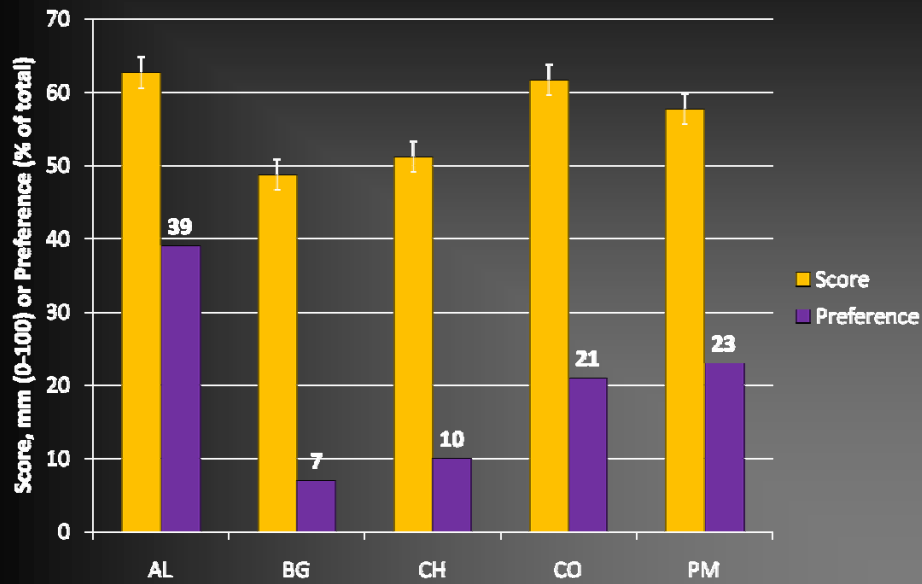
Postmortem Aging



Warner-Bratzler Shear Force, d 14



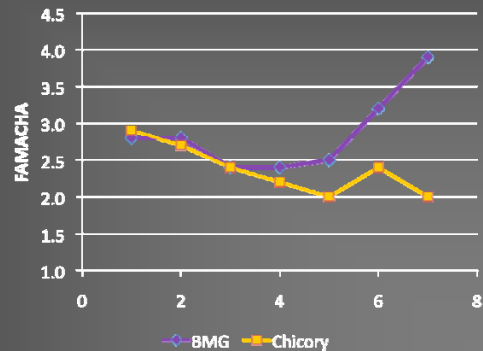
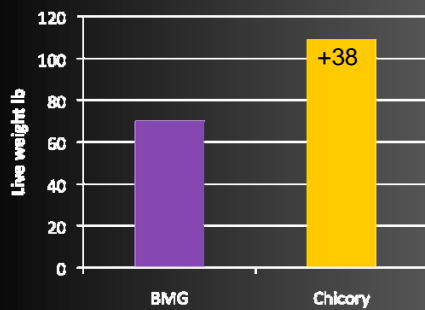
Consumer Panel



Lamb Grazing Study, 80 d

Bermudagrass

Chicory



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

nutrition

Clean eating means choosing fruits, vegetables raised, grown, and sold with minimal processing. Often rarely (if ever) should they contain additives. But in some cases today's food producers are neither clean nor sustainable. The our health, the environment, or both. So we decided to take through the eyes of the people who spend their lives uncover *not*—to eat. We asked them a simple question: "What foods answers don't necessarily make up a "banned foods" list. But suggested alternatives might bring you better health—and p

THE ENDOCRINOLOGIST WON'T EAT

Canned Tomatoes

FREDRICK VOM SAAL, PHD, is an endocrinologist at the University of Missouri who studies bisphenol-A.

THE PROBLEM: The resin linings of tin cans contain bisphenol-A, a synthetic estrogen that has been linked to ailments ranging from reproductive problems to heart disease, diabetes, and obesity. Unfortunately, acidity (a prominent characteristic of tomatoes) causes BPA to leach into your food. Studies show that the BPA in most people's body exceeds the amount that suppresses sperm production or causes chromosomal damage to the eggs of animals. "You can get 50 mcg of BPA per liter out of a tomato can, and that's a level that is going to impact people, particularly the young," says vom Saal. "I won't go near canned tomatoes."

THE SOLUTION: Choose tomatoes in glass bottles (which do not need resin linings), such as the brands Bionaturae and Coluccio. You can also get several types in Tetra Pak boxes, like Trader

Trade and Pomi

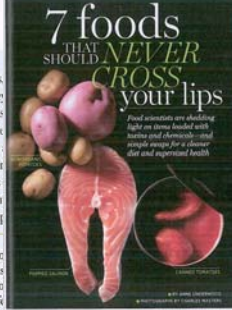
BUDGET TIP: If you substitute bottled past tomatoes. Look for low sodium and fat or you may have to

THE FARMER WON'T EAT

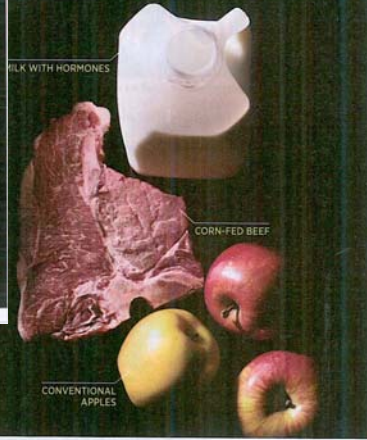
Corn-Fed Beef

JOEL SALATIN is co-owner of Polyface Farms and author of half a dozen books on sustainable farming.

THE PROBLEM: Cattle evolved to eat grass, not grains. But farmers today feed their animals corn and soybeans, which fatten up the animals faster for slaughter. But more money for cattle farmers (and lower prices at the grocery store) means a lot less nutrition for us. A recent comprehensive study conducted by the USDA and researchers from Clemson University found that compared with corn-fed beef, grass-fed beef is higher in beta-carotene, vitamin E, omega-3s, conjugated linoleic acid (CLA), calcium, magnesium, and potassium; lower in inflammatory omega-6s; and lower in saturated fats that have been linked to heart disease.



Food scientists are shedding light on items loaded with toxins and chemicals, and simple ways for a cleaner diet and improved health.



MILK WITH HORMONES

CORN-FED BEEF

CONVENTIONAL APPLES

"We need to respect the fact that cows are herbivores, and that does not mean feeding them corn and chicken manure," says Salatin.

THE SOLUTION: Buy grass-fed beef, which can be found at specialty grocers, farmers' markets, and nationally at Whole Foods. It's usually labeled because it demands a premium, but if you don't see it, ask your butcher.

BUDGET TIP: Cuts on the bone are cheaper because processors charge extra for deboning. You can also buy direct from a local farmer, which can be as cheap as \$5 per pound. To find a farmer near you, search eatwild.com.

THE TOXICOLOGIST WON'T EAT

Microwave Popcorn

OLGA NAIDENKO, PHD, is a senior scientist for the Environmental Working Group.

THE PROBLEM: Chemicals, including perfluorooctanoic acid (PFOA), in the lining of the bag, are part of a class of compounds that may be linked to infertility in humans, according to a recent study from UCLA. In animal testing, the chemicals cause liver, testicular, and pancreatic cancer. Studies show that microwaving causes the chemicals to vaporize—and migrate into your popcorn. "They stay in your body for years