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Grass-Fed vs. Conventionally Fed Beef

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Before making a comparison of grass-fed vs. grain-fed beef it is necessary to first define these two beef types. An animal is considered grass-fed, according to the USDA Grass Fed Marketing Claim Standards, when grass and forage are the "feed source consumed for the lifetime of the ruminant animal, with the exception of milk consumed prior to weaning. Animals cannot be fed grain or grain by-products and must have continuous access to pasture during the growing season. Hay, haylage, baleage, silage, crop residue without grain, and other roughage sources may also be included as acceptable feed sources. Routine mineral and vitamin supplementation may also be included in the feeding regimen" (AMS, 2007). In contrast, grain-fed beef are animals which were deliberately fed grain during their lifetime.

Trade publications are excellent in enumerating the characteristics used to compare grass-fed and conventionally fed beef: retail price, taste, tenderness, nutritional value, environmental impact, animal treatment, and cattle growth rate (Cross, 2011; DeBragga, 2011). These characteristics will serve as the categories by which this paper will compare grass-fed and grain-fed beef.

Retail Price

United States grass-fed beef has a higher retail price than grain-fed beef. Grass-fed beef is higher priced because of several significant factors: grass-fed cattle take longer to bring to market, require additional land, and require high quality pastures to finish cattle. "The carcass selling prices needed for the systems to breakeven ranged from $1.18/lbs for the Conventional system (grain-fed) to $2.22/lbs for the grass-fed system" (Nicolas Acevedo, 2006). Of course these values are not current, but the trend is the same relative to price.

Taste

A study was conducted, using Limousin-cross steers, to compare forage vs. grain feeding on carcass composition and palatability attributes of beef. Among other facts, the study found that ribeye roasts and ground beef from the steers had slightly less beef flavor and more off-flavor in forage-fed vs. grain-fed beef (Mandell, 1998). Daley et al. (2010) emphasizes "consumers should be aware that the differences in fatty acid content will also give grass-fed beef a distinct grass flavor." In fall-born Angus-cross steers, "flavor intensity and beef flavor scores were higher for strip loins from grain steers compared to rye grass finished steers" (Kerth, 2007). Taste differences between grass-fed and grain-fed beef are recognized and well documented.

Tenderness and Appearance

Research results comparing meat tenderness of grass-fed vs. grain-fed beef can be variable. But, results which compare the appearance of grass-fed and grain fed beef are consistent. Some research suggests no difference in tenderness and distinct differences in appearance, between grass-fed and grain fed beef. For example, "steaks from grass-fed heifers were similar to steaks from grain-fed heifers in tenderness." However, "Carcasses from grass-fed heifers were lighter in weight, coarser in lean

texture, in lean color and had more yellow fat than grain-fed heifer carcasses. Steaks from grass-fed heifers were similar to steaks from grain-fed heifers in tenderness, juiciness and flavor, but were darker in color during retail display. All steaks from grass-fed heifers were considered unacceptably dark in color after 5 days of display (J. D. Crouse, 1984)".

Thirty fall-born Angus-cross steers were finished on one of three different diets, grain, grain and ryegrass, and ryegrass. When meat comparisons were made, "initial and sustained tenderness scores of strip loins from steers finished on grain were higher when compared to rye grass regimens" and "yellowness values of the subcutaneous fat from both strip loins and ribeye rolls was lowest in cuts taken from steers finished on grain" (Kerth, 2007).

In a 1980 study comparing five different feeding systems, Schroeder et al. (1980) found that "steaks from carcasses of cattle fed the all-forage diets had limited retail acceptability and were scored lower for all palatability-determining characteristics. In their review of nine papers, Brewer and Calkins (2003) found that grass-fed beef is lower in tenderness (both from shear force and by taste panel), flavor and overall acceptability/desirability ratings.

Nutritional Value

Rule, 2008, pointed out some important facts to consider relative to nutritional value.

A major claim by the grass-fed beef industry is that grass-fed meat is a rich source of certain important fatty acids, in particular, the omega-3 fatty acids (ω-3), omega-6 (ω-6) fatty acids, and a fairly newly discovered fatty acid with significant potential for positive health benefits, conjugated linoleic acid, or CLA. The discrepancy in claims regarding these fatty acids developed from ambiguous interpretation of data.

When we determine the fatty acid composition of meat, we separate the fat from everything else in the meat sample by an extraction process. We then have a "pool" of fat from which we can analyze completely. Within this pool of fat, the ω-3, ω-6, CLA, and all other fatty acids occur, including saturated fatty acids. Within the pool of fatty acids, some of these fatty acids will occur at higher or lower proportions (also referred to as percentages of the total pool of fatty acids) of the entire pool. For example, if the proportion of saturated fatty acids decreased, then something else would increase. Within the pool of fatty acids that would be extracted from a sample of grass-fed beef, we should expect to see a greater proportion of the ω-3 fatty acids because this type of fatty acid represents a high-proportion of the fat in the grass.

However, grass is not a rich source of fat, so the amount of fat consumed will not be very great. Also, we should expect the meat of grass-fed beef, once trimmed of excess fat, to be quite lean. This means that the meat will not have very much fat either. Thus, the pool of fat in the meat of grass-fed beef will likely be lower than what we would find in well-marbled beef. So, if we express the ω-3 fatty acids found in the fat pool as a percentage of the total pool fatty acids, this value could be five times greater than what we find in the fat of feedlot beef. On the other hand, if we compare the actual amount of ω-3 in the fat pool, the picture changes dramatically. So, what did we provide with the grass-fed beef? We provided a leaner product with residual fat that contained a higher proportion and amount of ω-3. But, how much did we provide? The answer should be surprising based on the claims about how rich a source of this important fatty acid is with grass-fed beef.

For CLA, the picture also is not too great compared with claims about this one. It is, however, important to emphasize CLA when developing your grass-fed or feedlot systems because this fatty acid will likely be one with the farthest reaching health benefits.

So, why the low CLA levels? CLA is a product that starts off in the diet as a plant-based fat. After consumed by the animal (has to be a ruminant) the unsaturated fatty acids are going to be modified by the rumen bacteria so that the unsaturated fatty acids are converted to saturated fatty acids. This does not happen in one step. There are intermediate steps that first convert the plant-based fatty acid to CLA, but then this CLA is rapidly converted to a different fatty acid, one with less unsaturation. The final step produces the saturated fatty acid that will be the primary fatty acid absorbed in the small intestine. However, the intermediate steps produced modified fatty acids, and some of them will be

washed down the tract to the intestine where they will be absorbed. The CLA doesn't stay around very long, so amounts absorbed are very, very low. But the intermediate fatty acid that occurs when this CLA is modified doesn't get modified nearly as quickly, so more of this last intermediate will wash into the intestine for absorption. When this last intermediate fatty acid is moved to fat tissue cells, or mammary gland cells of a lactating cow, it gets converted back to CLA, but only about 25% of the intermediate fatty acid will get converted back.

The major point here is that it is an intermediate breakdown product that is converted to CLA in fat tissue or mammary gland cells, so not much will be available, and the CLA in meat is a fat-associated product. So, if the meat is lean the CLA level will not be very high. Based on our work on lean meat, this was the case.

Daley et al. (2010), after enumerating the nutritional benefits of grass-fed beef, warns grass-fed beef "has a distinct grass flavor and unique cooking qualities that should be considered when making the transition from grain-fed beef. In addition, the fat from grass-finished beef may have a yellowish appearance."

Environmental Impact

Over 30 years ago Pimentel et al. (1980) maintain that "using pasture and grazed forest-range for a system of producing live-stock by feeding grass alone reduces the inputs of energy about 60 percent and land resources about 8 percent." In addition to energy and resource savings, Kate Clancy (2006) in a review of scientific literature found that scientist generally agree that grass-fed beef benefit the environment through decreased soil erosion, increased soil fertility, improved water quality, and improved human health (due to reduced antibiotic use).

Animal Treatment

In recent years, the humane treatment of confined animals such as pigs, chickens, and feedlot cattle has been a growing concern to some in society. Clancy (2006) points out that grass-fed cattle are healthier and have less need for antibiotics than feedlot cattle. Acevedo (2006) states that, E. Coli contamination in grass-fed cattle is almost nonexistent. It is clear that fewer health problems exist in cattle that are grass-fed. This only makes sense since confinement bring animals into closer proximity and increases the likelihood of the spread of disease. Using considerable documentation, Conner (2008) also maintains that "pasture-based agriculture is widely seen as being more humane raising animals outdoors may result in less stress and anti-social behavior and improved health for the animals."

Conclusion

Grain-fed beef has several advantages over grass-fed beef. Grain-fed beef is grown faster, requiring less land and time. Grain-fed beef also has more acceptable meat qualities such as flavor, appearance, tenderness and has lower retail cost. Grass-fed beef, on the other hand, requires fewer resources and has less environmental impact than grain-fed beef. In terms of nutrition, the jury is still out on whether grass-fed beef contains more beneficial nutrients for humans. Cattle which are grass fed have fewer health problems, including less stress and anti-social behavior.

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