Fatty Acid Profile Analysis- A comparison of nutrient density in products from Nourished by Nature, regional “health food” brands, and conventionally grown, commodity sources

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August 2021

Introduction

For the past 25 plus years, we have focused on improving the soil health on our ranch. We have done this through the way that we manage our crops, livestock, and perennial grasslands. Following the six principles of soil health has increased the overall function and health of our soils. Organic matter levels, biological activity, water infiltration and holding capacity, and carbon levels have all increased substantially and continue to rise. So what does that mean exactly and how does it correlate to the end products (meats and grains) that we grow and raise on our land? How does that affect the nutrient-density of these products?

Recently, we had our proteins tested for nutrient-density to see if our management and our healthy soils actually make a difference on the quality of our products. A complete fatty acid profile analysis was performed, which allows us to compare the nutritional value of the products raised on our ranch to products derived from ranches that do not focus on soil health.

Now more than ever, doctors are coming to the realization that healthy fats are actually good for the human body. As they and consumers have become more aware of this, many diets have taken hold throughout society that promote foods that are high in healthy fats. Some of them include Whole 30, Paleo, Carnivore and Keto diets (Mawer). We discuss the individual health benefits of each fatty acid tested in the results section.

Materials and Methods

We sent each of the following products to a lab and compared them to the same cuts that can be purchased at a local supermarket here, in Bismarck, ND. For each category, we tested Nourished by Nature products, a product that is promoted as being grass-based/all natural, and a conventional (industrial-raised) product. While there were over 40 fatty acids tested for each product, we share those that are most commonly used as indicators reflecting the greatest cardiovascular health benefits. All of the samples tested were ground prior to pulling the test sample to ensure a homogenized subject.

Beef

For beef, we compared a Nourished by Nature boneless ribeye steak to a regional grass-fed brand and a conventional grain-fed brand (industry standard). Our cattle are born out on grass, raised on grass and regeneratively-grown cover crop forages and bale grazed over the winter. They are truly 100% grass-fed and grass-finished. The regional grass-fed brand is also truly grass-fed and grass-finished, just to a different standard and not on regeneratively managed land. The conventional grain-fed cattle are born on grass and finished in a feedlot eating mainly GMO corn and soybean meal, silage, and other grains. Results for our beef comparison can be found in Figures 1-9, and 16-18 below.

Pork

For pork, we compared samples of pork chops coming from three different types of management regimes. On our farm, the pigs are born in a barn, then moved to a large pen until they are weaned at 60 days of age. From there, they are turned out to pasture and moved

weekly. While on pasture, the pigs are allowed to graze and root for what is available as well as offered a home-grown non-GMO, ground grain mix of typically oats, peas, barley and flax. We do not use antibiotics.

The second sample came from a brand that farrows their sows in small pens, then at weaning, puts their feeder pigs in large barns with access to the outdoors. These pigs are fed a diet of non-GMO corn and soybean meal. This pork is also antibiotic-free. The final sample came from an “all-natural” brand that is prominent throughout the midwest. This company raises their pigs in a confinement barn for their entire lives. They are also fed a diet of GMO corn and soybeans with vitamins and minerals added to the feed ration. Antibiotics are used when deemed necessary and biosecurity protocols are in place. This operation is an example of how the majority of pork is raised in the US. Results for our pork comparison can be found in Figures 1-6, 10, 11, and 16-18 below.

Chicken

We compared our chicken breasts to one other commonly found conventional brand. The chicken that we offer is raised by our good friends, David and Mariah Boatright, in central Missouri. They receive their chicks as day-olds and brood them out on pasture. They are moved daily throughout their entire lives to fresh pasture and are also fed a non-GMO grain diet. Once they reach harvest weight, they are processed on the farm. The conventional chicken is raised in a large confinement barn their entire life. They are fed a diet of GMO corn, soybean meal, vitamins and minerals and aren’t given antibiotics, which is typical for the majority of chicken raised in the US. Results for our chicken comparison can be found in Figures 1-6, 12, 13 and 16-18 below.

Eggs

Finally, we compared our eggs to two other brands. Our hens are raised out on pasture and are truly free-range, meaning that they have unlimited access to pasture. They are allowed to forage for insects, seeds and vegetation. In the winter, we keep them in a hoop house with deep wood chip bedding and plenty of space. If the weather permits, they are let outside during the day. They are fed a mix of oats, barley, flax and peas that we grow on our farm. The first comparison sample was from an Organic “free-range” brand. These hens are guaranteed 108 square feet of pasture per bird, but also spend time in a barn. They are fed a mix of organic grains. The final sample is from a large conventional brand. These hens are raised in cages in large barns. They are fed a mix of GMO corn and soybean meal with vitamins and minerals added to the ration. These eggs are how the majority of eggs are produced in the US. Results for our egg comparison can be found in Figures 1-6, and 14-18 below.

Results

Alpha Linolenic Acid (ALA)

Alpha Linolenic Acid (ALA) is an essential omega-3 acid that is important for our growth and development. It is also believed to decrease the risk of heart disease and blood clots. For our beef, ALA was 69% higher than the regional grassfed brand and 528% higher than the conventional, grain fed steak. Our pork was 114% higher than the non-GMO brand and 1030% higher than the conventional “all-natural” brand. The chicken samples showed that our birds have 55% more ALA. Finally, our eggs were 28% higher than the organic “free-range” brand and 292% higher than the conventional eggs.

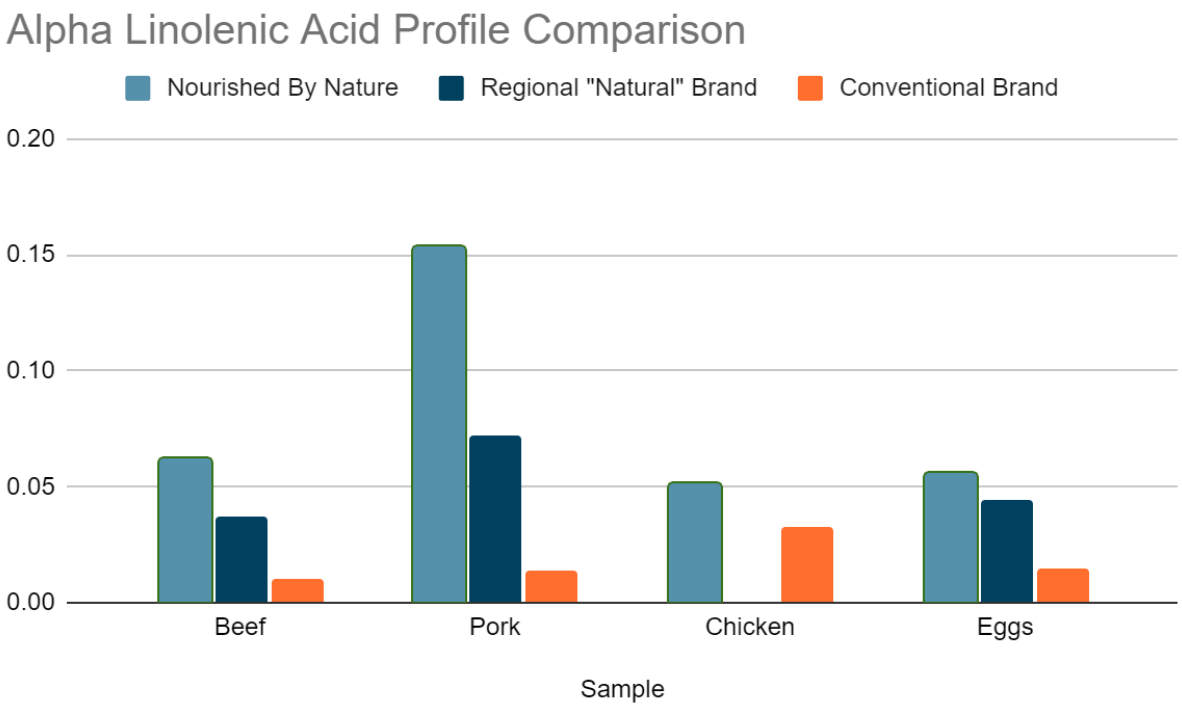

Figure 1: An ALA comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Eicosapentaenoic Acid (EPA)

Eicosapentaenoic Acid or EPA is a heart-healthy Omega-3 commonly found in coldwater fish. However, it can also be found in lower levels of other animal proteins. EPA is commonly used as a supplement to reduce blood triglyceride levels and is also thought to decrease depression.

Our steak was 7% higher than the regional grassfed brand and 54% higher than the conventional grain fed steak.

The Nourished by Nature pork chop was 40% higher than the non-GMO brand and 91% higher than the conventional brand.

Our chicken breast was 38% higher in EPA than the conventional brand.

EPA is not typically found in eggs unless chickens are supplemented with fish oil, which is why trace amounts were found in the conventional brand (Schwarcz).

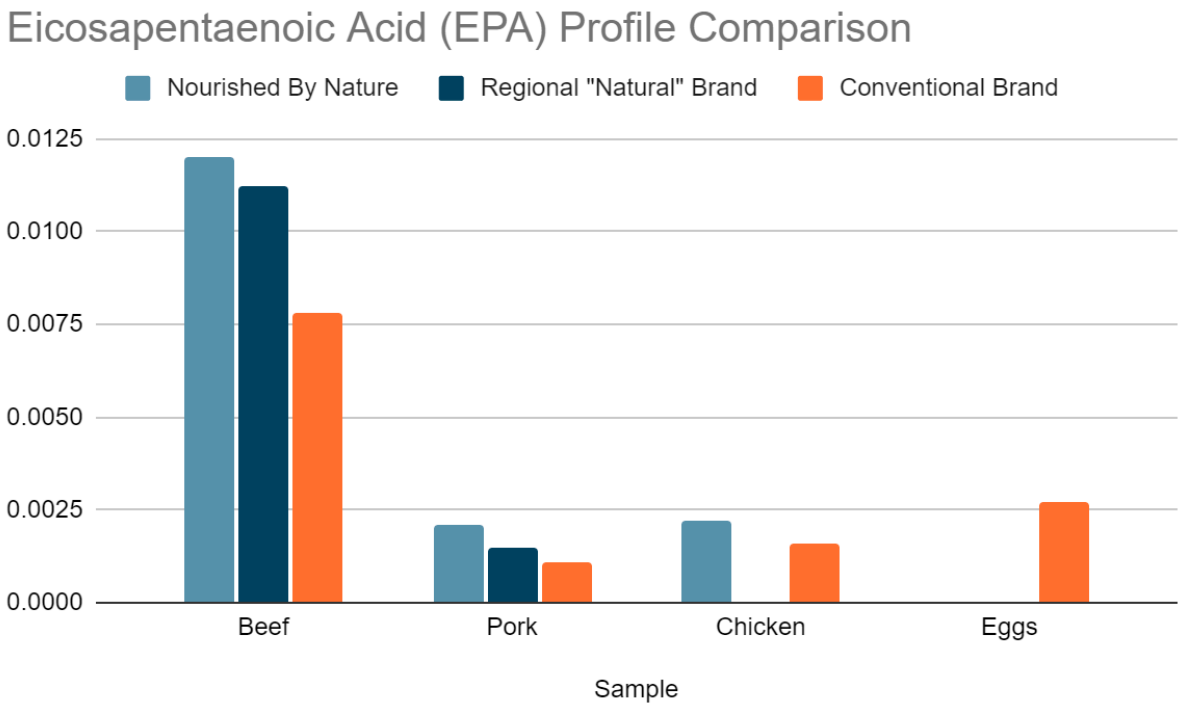

Figure 2: An EPA comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Docosapentaenoic Acid (DPA)

Docosapentaenoic Acid or DPA has been linked to many improvements in human health, such as lowering the risk of heart attack or myocardial infarction by improving overall aortic function of the heart as it is important for growth and development of the central nervous system (Zhang et al.). Our steak was found to contain 42% and 58% more DPA than the regional brand and the conventional brand, respectively.

Our pork chop was found to contain 56% and 218% more than the non-GMO and conventional brands, respectively.

Our chicken breast was found to contain 102% more DPA than the conventional brand.

Our eggs were found to contain 282% and 748% more DPA than the non-GMO and conventional brand, respectively.

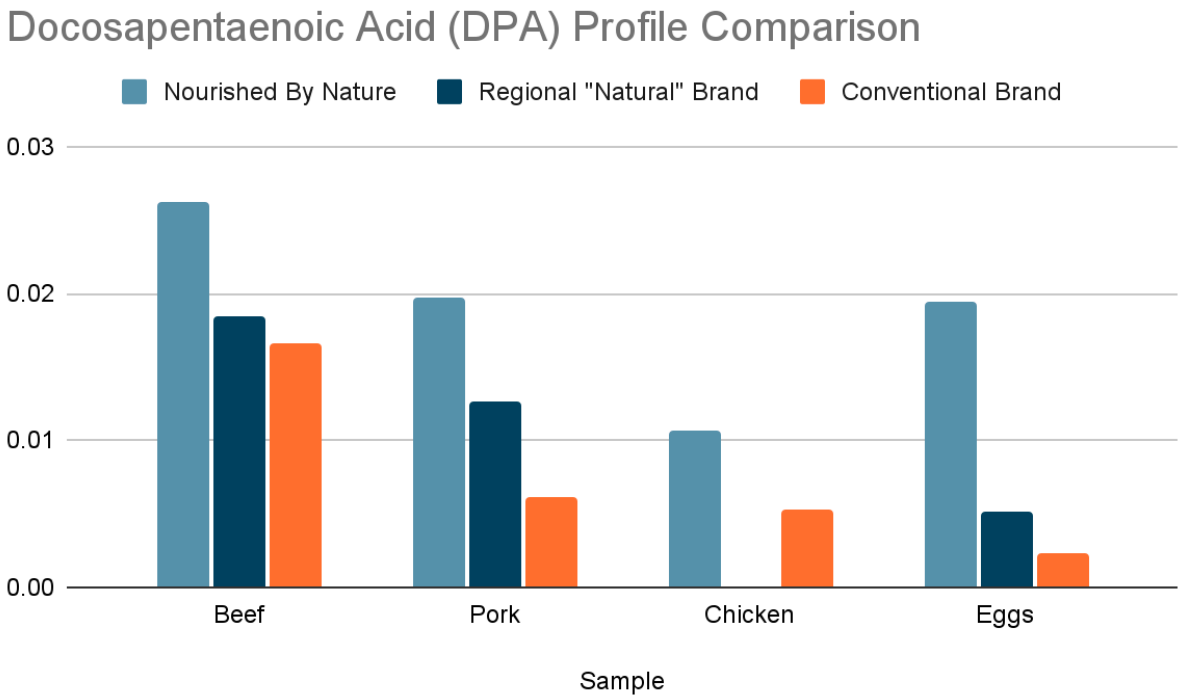

Figure 3: A DPA comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Docosahexaenoic Acid (DHA)

Docosahexaenoic Acid (DHA) is an omega-3 fatty acid essential for brain development during pregnancy and early childhood. It is also linked to improved heart health, better vision, and reduced inflammatory response (Wong). Our beef was 86% and 73% higher in DHA than the regional and conventional brands, respectively.

Our pork was 157% and 350% higher than the non-GMO and conventional brands, respectively.

Our chicken was 126% higher in DHA than the conventional brand.

Our eggs were 70% and 424% higher than the organic and conventional brands, respectively.

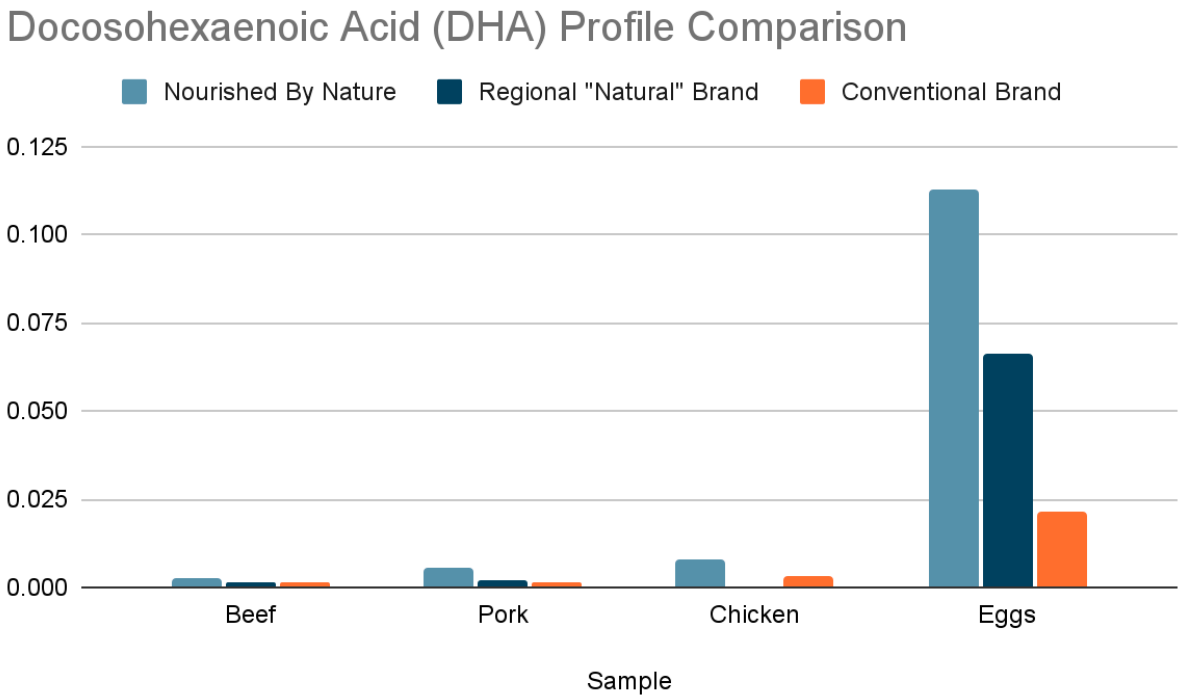

Figure 4: A DHA comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Omega-6/Omega-3

People who ate a pre-industrial diet had an omega-6 to omega-3 ratio in a range of about 4:1 to 1:4, most falling somewhere in between. The average ratio today is 16:1, much higher than what people are genetically adapted to. Scientists believe omega-6s are pro-inflammatory, while omega-3s are anti-inflammatory. Of course, inflammation is essential for your survival. It helps protect your body from infection and injury, but it can also cause severe damage and contribute to disease when it's chronic or excessive. Research shows that a diet rich in Omega 3's may help to prevent and reduce symptoms of depression, ADHD, and bipolar disorder, protect against memory loss and dementia, reduce the risk of heart disease, stroke, and cancer; ease arthritis, joint pain, and inflammatory skin conditions; support a healthy pregnancy; battle fatigue, sharpen your memory, and balance your mood (Segal).

Scientists have also hypothesized that a diet high in omega-6s but low in omega-3s increases inflammation, while a diet that includes balanced amounts of each reduces inflammation (Robertson). So in general, the lower the omega 6:3 ratio, the better. In our beef testing, we found our ribeyes to have a ratio of 1.31:1 which is in the highly desirable range of 4:1 to 1:4, making our grass-finished beef highly nutritious with regards to Omega fatty acids. This is good news because dieticians typically put beef in the “bad” fat category, limiting dietary recommendations to 10% of daily caloric intake. However, when looking at the regeneratively raised grass-fed beef omega 6:3 ratio results, the fatty acid profile is even better than wild-caught salmon (3:1) (Sonia).

The regional and conventional brands, however, had ratios of 2.18:1 and 6.19:1, respectively. Although the regional brand still falls within the recommended ratio range, it is still significantly higher (66%) than our beef. The conventional beef did not fall within the recommended range and shows a 371% increase in the omega 6:3 ratio.

Interestingly, the Nourished by Nature and regional brand beef samples were the only ones to fall within the recommended Omega 6:3 ratio range. However, all the Nourished by Nature samples still fall below the American diet average of 16:1 as well as the typical ratio of farmed salmon, a supposed source of healthy Omega 3’s (14:1) (Sonia). The conventional and regional brands for all the other samples consistently show a substantial increase in Omega 6:3 ratio. The regional and conventional pork samples showed a 38.2% and 106.9% increase in Omega 6:3 ratio, respectively. The conventional chicken sample showed an 83.92% increase in Omega 6:3 ratio. The regional and conventional egg samples showed 29.7% and 70% increase in Omega 6:3 ratio, respectively.

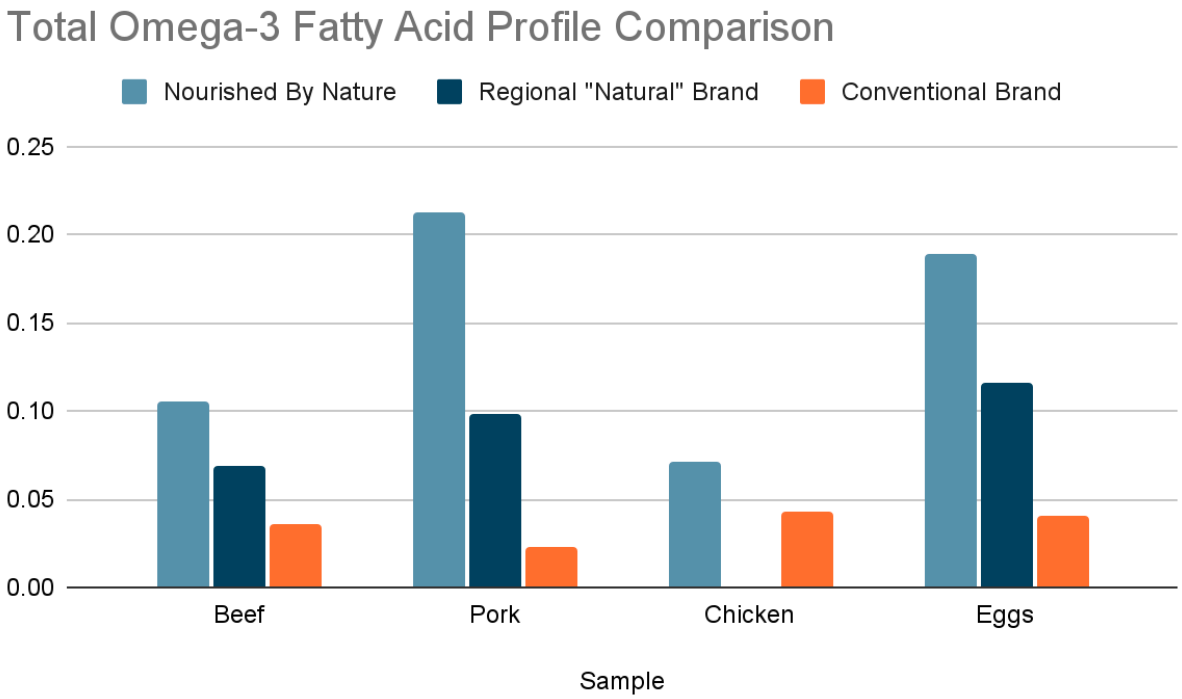

Figure 5: An Omega-3 comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

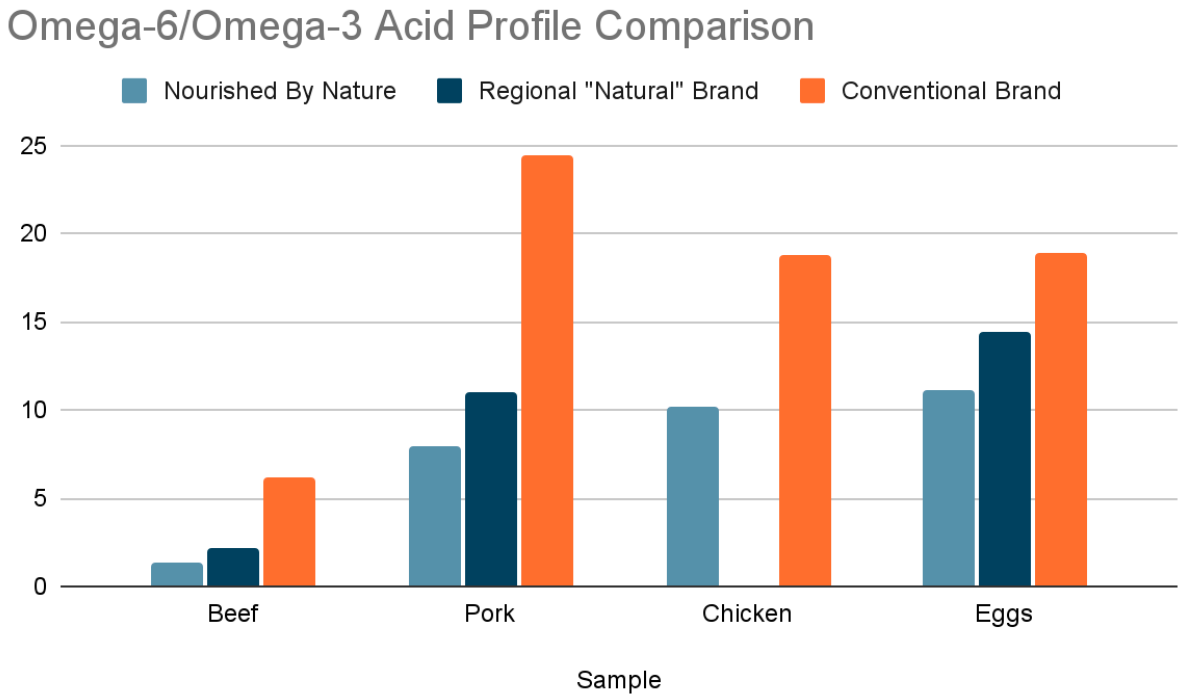

Figure 6: An Omega 6:3 Ratio comparison in bar graph form across all samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Conjugated Linoleic Acid (CLA)*

CLA is essentially a type of polyunsaturated, omega-6 fatty acid. In other words, it's technically a trans fat — but a natural type of trans fat that occurs in many healthy foods. Cows and other pastured ruminants such as sheep have a unique enzyme in their digestive system that converts the omega-6 fatty acids in green plants to CLA, making dairy and meat from cows, goats and sheep the main dietary sources of CLA. Since CLA's are unique to ruminants, we did not provide data on CLA for our pork, chicken and eggs. Many studies show that people who eat the most CLA have improved metabolic health and a lower risk of many diseases such as cancer and Type 2 Diabetes (Gunnars). The beef comparison shows a 46% and 210% increase in Nourished by Nature's CLA's compared to the regional and conventional brands, respectively.

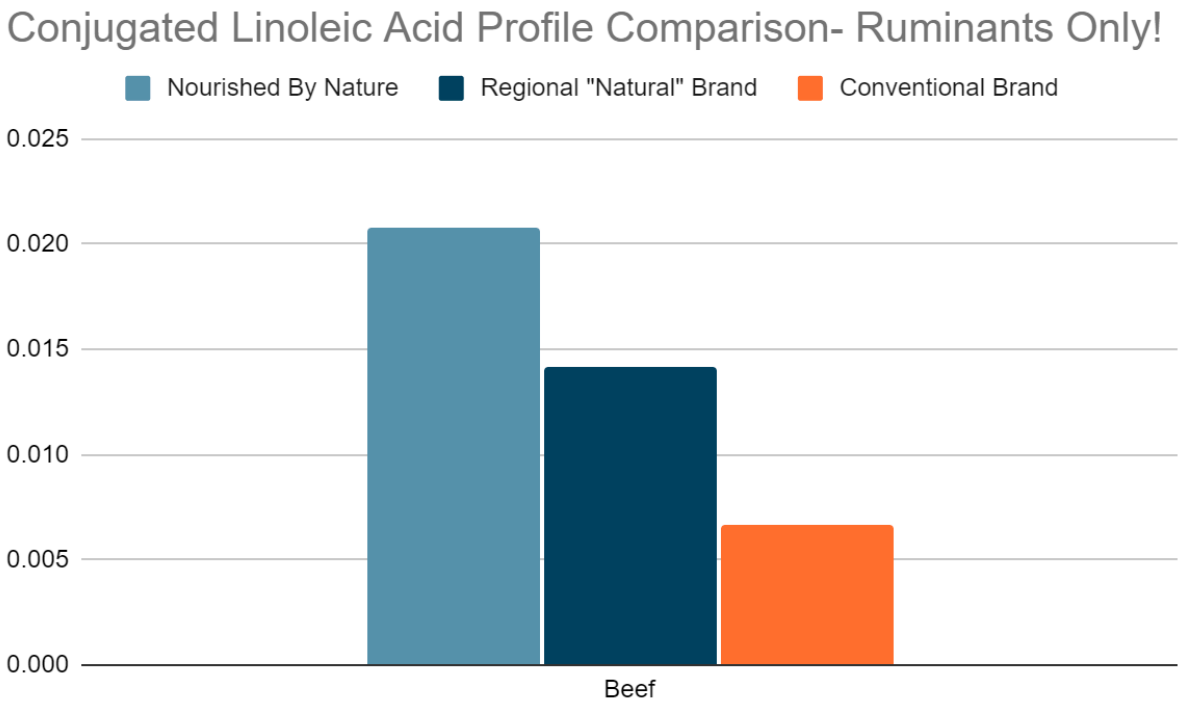

Figure 7: A CLA comparison in bar graph form across all beef samples. Data is a measurement of grams of fatty acid per 100 grams of product.

Discussion

It is also important to note the price differences between all of these products as this information is meant for the consumer's education to aid in decision making when considering the most nutrient-dense, and cost-effective, options for themselves and their families.

In Figure 17, the pricing for all these products is listed. After adjusting for size differences to allow for comparable pricing, the difference in price from Nourished by Nature to other brands was calculated. Then the average percent increase in beneficial fatty acids was divided by the percent difference in price to show how far the extra price tag really goes. In doing this, one can quantify the extra nutrients gained from each extra dollar spent on Nourished by Nature products.

When compared to the conventional brands, each extra dollar spent on a Nourished by

Nature Ribeye Steak amounted to a 61.94% increase in beneficial fatty acid content. Each extra dollar spent on a Nourished by Nature Pork Chop amounted to 71.98% more beneficial fatty acids. Each extra dollar spent on a Nourished by Nature Chicken Breast amounts to a 7.53% increase in beneficial fatty acids. Each extra dollar spent on Nourished by Nature Eggs amounts to a 174.72% increase in beneficial fatty acids.

If that isn't enough to make up for the additional cost, there are many other factors to consider as well. These factors include environmental impacts, animal welfare, and community and local economy enrichment. The few extra dollars spent on protein coming from a regenerative farm contributes to mitigating climate change by drawing Carbon out of the atmosphere and bringing balance back to our water and carbon cycles. It also contributes to animals getting to express their true nature out on pasture, living enjoyable lives where they have the opportunity to be part of a productive and harmonious ecosystem, full of biodiversity and wildlife. Finally, it contributes to the livelihoods of the actual farmers themselves who took part in stewarding the life of each animal from start to finish.

Conclusion

Our results show that different management styles can have a direct effect on the fatty acid composition of the protein being raised which has been shown to have a direct correlation with improved health benefits. Although this analysis is just a glimpse at a portion of the nutrient profile of the provided samples, the results are statistically significant. Although the conventional products shown above cost the least to the end consumer, the price tag is only a fraction of the total cost of production due to government subsidies, opportunity costs, animal welfare and environmental impacts. A complete valuation of these additional costs associated with the conventional model is beyond the scope of this article. However, it is important to note that the difference in price you pay for a regeneratively raised product is with good reason.

It is our intent to do more nutrient testing on our products to further prove that livestock raised on healthy soils and that are managed correctly in fact are more nutrient-dense for those of us that consume them.

Additional Figures

Figure 8: Fatty Acid Profile Comparison in Beef- Grass Finished vs. Grass Fed vs. Conventional

Fatty Acid Measured in Grams per 100g of product	Nourished by Nature	Regional 100% Grass-Fed Brand	Conventional Grain-fed Brand
Alpha Linolenic Acid (ALA)	0.0622	0.0369	0.0099
Eicosapentaenoic acid (EPA)	0.012	0.0112	0.0078
Docosapentaenoic acid (DPA)	0.0262	0.0184	0.0166
Docosahexaenoic Acid (DHA)	0.0026	0.0014	0.0015
Total Omega-3 Fatty Acids	0.1056	0.0693	0.0358
Total Omega-6 Fatty Acids	0.1416	0.1508	0.2216
Omega-6/Omega-3	1.314	2.1777	6.1933
Conjugated Linoleic Acid (CLA)*	0.0208	0.0142	0.0067

*CLA's are only found in ruminants, therefore this figure is only available in our beef analysis. We did not collect data on our grass-finished lamb due to the lack of regional availability of a *conventional* comparison product.

Figure 9: Beneficial Fatty Acids Percent Difference in Beef- Grass-Finished vs. Grass-Fed vs. Conventional

	% Higher in NBN/Regional	% Higher in NBN/Conventio	% Higher in Regional/NBN	% Higher in conventional/NBN

		nal		
Alpha Linolenic Acid (ALA)	68.6	528.3		
Eicosapentaenoic acid (EPA)	7.1	53.9		
Docosapentaenoic acid (DPA)	42.4	57.8		
Docosahexaenoic Acid (DHA)	85.7	73.3		
Total Omega-3 Fatty Acids	52.4	195.0		
Conjugated Linoleic Acid (CLA)*	46.5	210.5		
Total Omega-6 Fatty Acids			6.5	56.5
Omega-6/Omega-3			65.7	371.3

Figure 10: Fatty Acid Profile Comparison in Pork- Pasture Raised vs. Non-GMO vs. Conventional

Fatty Acid Measured in Grams per 100g of product	Nourished by Nature	Outdoor Access Allowed, Non-GMO Fed Brand	All-Natural Confinement Midwest Brand
Alpha Linolenic Acid (ALA)	0.1537	0.0717	0.0136
Eicosapentaenoic Acid (EPA)	0.0021	0.0015	0.0011
Docosapentaenoic Acid (DPA)	0.0197	0.0126	0.0062
Docosahexaenoic Acid (DHA)	0.0054	0.0021	0.0012
Total Omega-3 Fatty Acids	0.2131	0.0982	0.0229

Total Omega-6 Fatty Acids	1.6964	1.0804	0.5605
Omega-6/Omega-3	7.961	11.006	24.4306

Figure 11: Beneficial Fatty Acid Profile Percent Difference in Pork- Pasture Raised vs. Non-GMO vs. Conventional

	% Higher in NBN/Regional	% Higher in NBN/Conventional	% Higher in Regional/NBN	% Higher in conventional/NBN
Alpha Linolenic Acid (ALA)	114.4	1030.1		
Eicosapentaenoic acid (EPA)	40.0	90.9		
Docosapentaenoic acid (DPA)	56.3	217.7		
Docosahexaenoic Acid (DHA)	157.1	350.0		
Total Omega-3 Fatty Acids	117.0	830.6		
Total Omega-6 Fatty Acids	57.0	202.7		
Omega-6/Omega-3			38.2	206.9

Figure 12: Fatty Acid Profile Comparison in Chicken- Pasture Raised vs. Conventional

Fatty Acid Measured in Grams per 100g of product	Nourished by Nature	Conventional Brand
Alpha Linolenic Acid (ALA)	0.0513	0.0331
Eicosapentaenoic Acid (EPA)	0.0022	0.0016
Docosapentaenoic Acid (DPA)	0.0107	0.0053

Docosahexaenoic Acid (DHA)	0.0077	0.0034
Total Omega-3 Fatty Acids	0.0718	0.0435
Total Omega-6 Fatty Acids	0.735	0.8191
Omega-6/Omega-3	10.2322	18.8187

Figure 13: Beneficial Fatty Acid Profile Percent Difference in Chicken- Pasture Raised vs. Conventional

	% Higher Beneficial Fatty Acids in NBN/Conventional	% Higher Beneficial Fatty Acids in Conventional/NBN
Alpha Linolenic Acid (ALA)	55	
Eicosapentaenoic acid (EPA)	37.5	
Docosapentaenoic acid (DPA)	101.89	
Docosahexaenoic Acid (DHA)	126.47	
Total Omega-3 Fatty Acids	65.06	
Total Omega-6 Fatty Acids		11.44
Omega-6/Omega-3		83.92

Figure 14: Fatty Acid Profile Comparison in Eggs- Pasture Raised vs. Organic vs. Conventional

Fatty Acid Measured in Grams per 100g of product	Nourished by Nature	Organic, “Free-Range” Brand	Conventional Brand
Alpha Linolenic Acid (ALA)	0.0564	0.0439	0.0144
Eicosapentaenoic Acid (EPA)	0	0	0.0027

Docosapentaenoic Acid (DPA)	0.0195	0.0051	0.0023
Docosahexaenoic Acid (DHA)	0.1126	0.0664	0.0215
Total Omega-3 Fatty Acids	0.1885	0.1155	0.0409
Total Omega-6 Fatty Acids	2.0976	1.6665	0.7732
Omega-6/Omega-3	11.1299	14.4313	18.9228

Figure 15: Fatty Acid Profile Percent Difference in Eggs- Pasture Raised vs. Organic vs. Conventional

	% Higher in NBN/Regional	% Higher in NBN/Conventional	% Higher in Regional/NBN	% Higher in Conventional/NBN
Alpha Linolenic Acid (ALA)	28.5	291.7		
Eicosapentaenoic acid (EPA)			0	N/A
Docosapentaenoic acid (DPA)	282.4	747.8		
Docosahexaenoic Acid (DHA)	69.6	423.7		
Total Omega-3 Fatty Acids	63.2	360.9		
Total Omega-6 Fatty Acids	25.9	171.3		
Omega-6/Omega-3			29.7	70.0

Figure 16: Average Percent Increase of Beneficial Fatty Acids for Nourished by Nature Compared to Conventional and Regional Brands.

	Average % Increase in Beneficial Fatty Acids- NBN vs. Regional Brand	Average % Increase in Beneficial Fatty Acids- NBN vs. Conventional Brand
Beef	50.44	186.45

Pork	96.97	503.87
Chicken	N/A	77.18
Eggs	110.90	456.02

Figure 17: Pricing for each Product*

Price in $/Package	12 oz. Beef Ribeye Steak	8 oz. Boneless Pork Chop	14 oz. Package of Chicken Breasts	1 Dozen Eggs
Nourished by Nature	$21	$10	$14	$4
Regional Brand	$17.99	$3.25	N/A	$3.79
Conventional Brand	$17.99	$3.00	$3.75	$1.39
Price Difference of NBN and Regional Brand	$3.01	$6.75	N/A	$0.21
Price Difference of NBN and Conventional Brand	$3.01	$7.00	$10.25	$2.61
% Higher Price for NBN/Regional Brand	16.7	207.7	N/A	5.5
% Higher Price for NBN/Conventional Brand	16.7	233.3	273.3	187.8

*Pricing adjusted to represent equal weights of product among different brands.

Figure 18: Average % Higher Beneficial Fatty Acids Divided by Price Difference for Nourished by Nature Products

	Avg. % Higher Beneficial Fatty Acids/ Price Difference	
	Regional	**Conventional**
Beef	16.76	61.94
Pork	14.37	71.98
Chicken	N/A	7.53

Eggs	528.11	174.72

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