Eat Real Grassfed Beef

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Edacious

QUALITY MATTERS

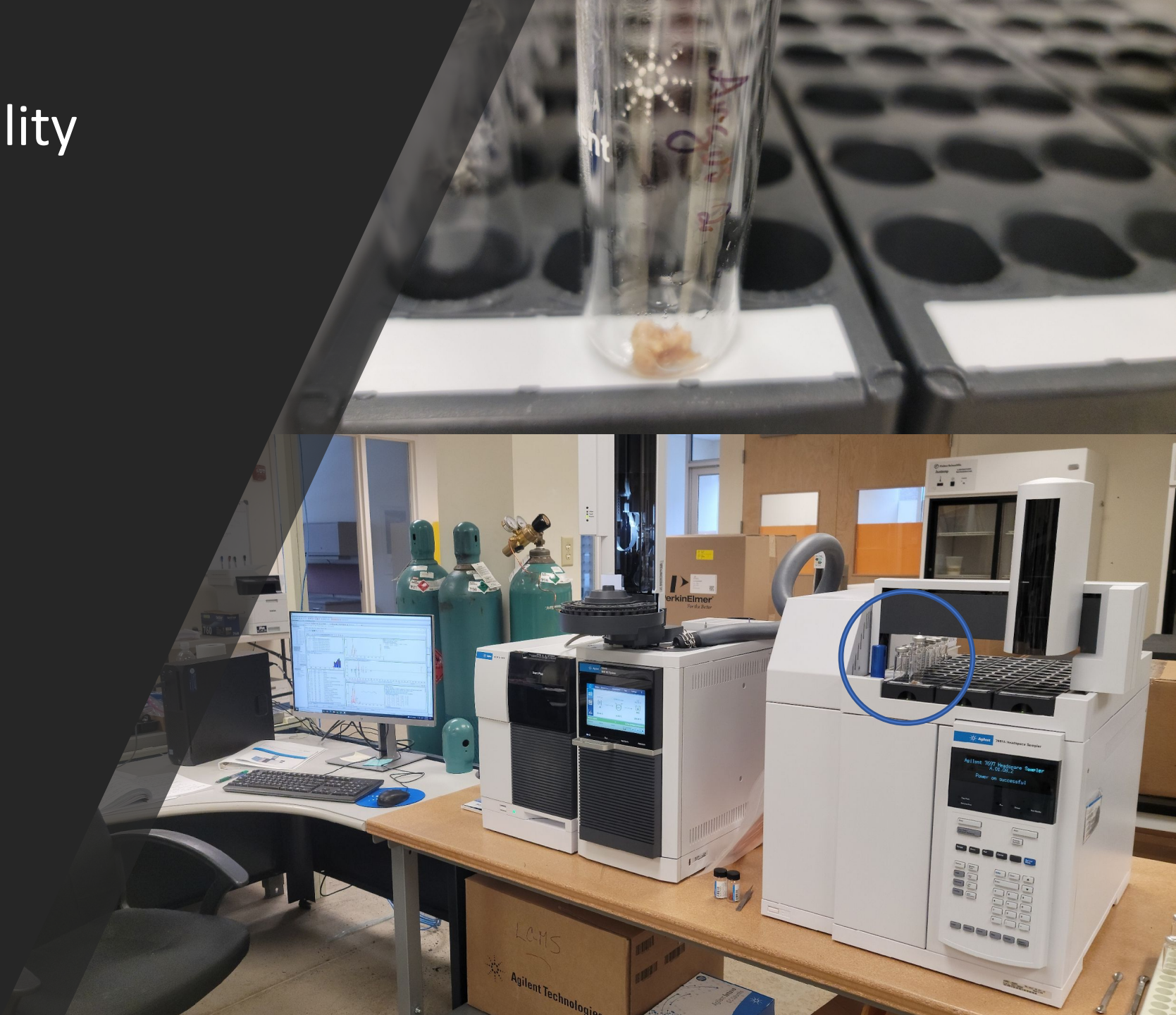
Dryland Tallgrass Prairie Grazing in Southwest Kansas

Differentiating Beef Quality

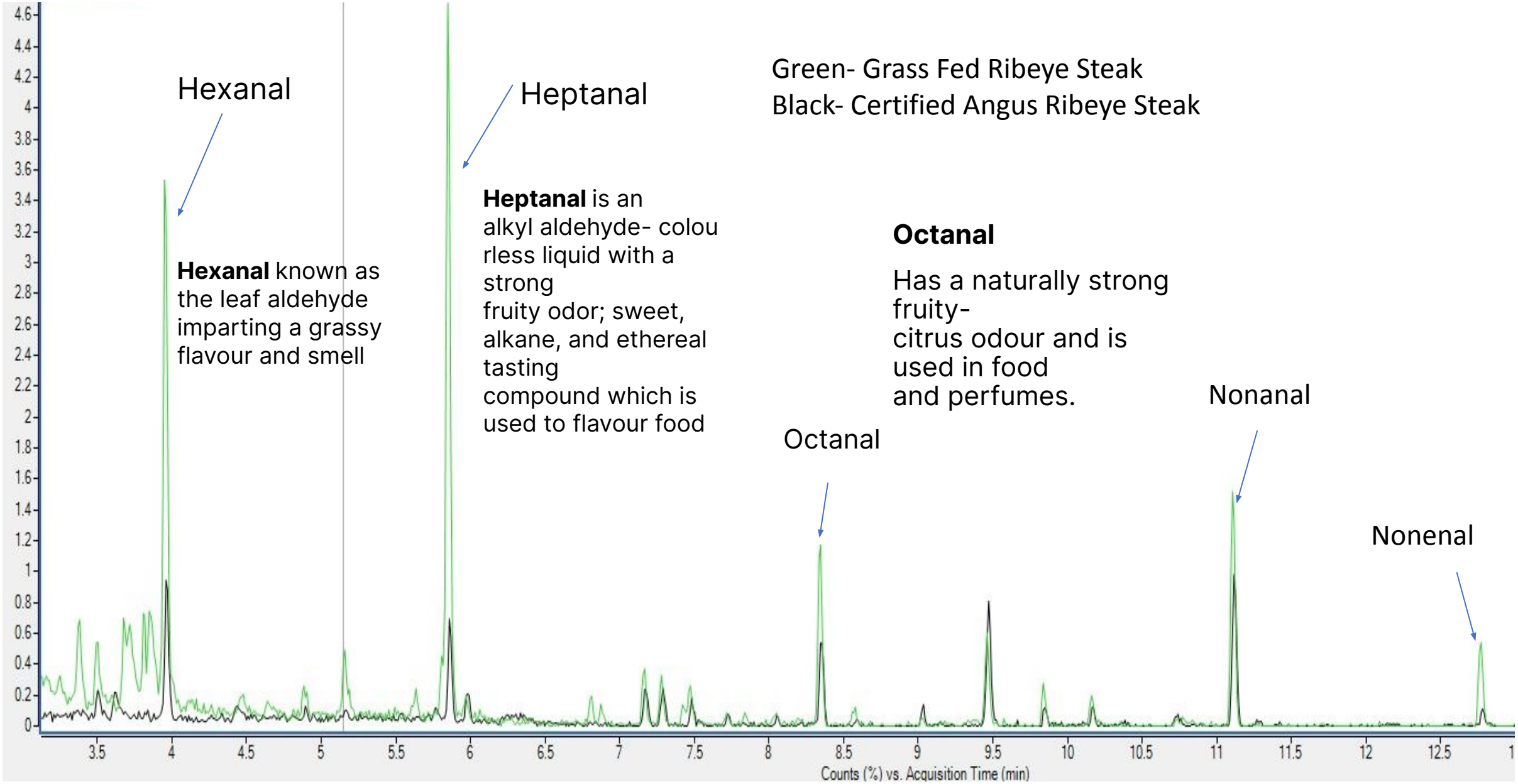
We use a Gas Chromatograph Mass Spectrometer (GC-MS) to analyse volatile compounds in fat, and fatty acids in the meat. We explored the differences between 3- Ranch grass born, bred and raised beef with 3-Ranch TMR finished beef, and store-bought beef. We compared both ground meat and rib eye steak meat.

We used an ICP (Ion coupled plasma spectrophotometer) – MS to analyse the mineral nutrient content in the same meat samples.

Here's what we found…….



Differentiating Grassfed from Total Mixed Ration(TMR)Beef



Green- Grass Fed Ribeye Steak
Black- Certified Angus Ribeye Steak

Hexanal known as the leaf aldehyde imparting a grassy flavour and smell

Heptanal is an alkyl aldehyde- colou rless liquid with a strong fruity odor; sweet, alkane, and ethereal tasting compound which is used to flavour food

Octanal

Has a naturally strong fruity- citrus odour and is used in food and perfumes.

Differentiating Grassfed from Total Mixed Ration(TMR)Beef

Nonanal

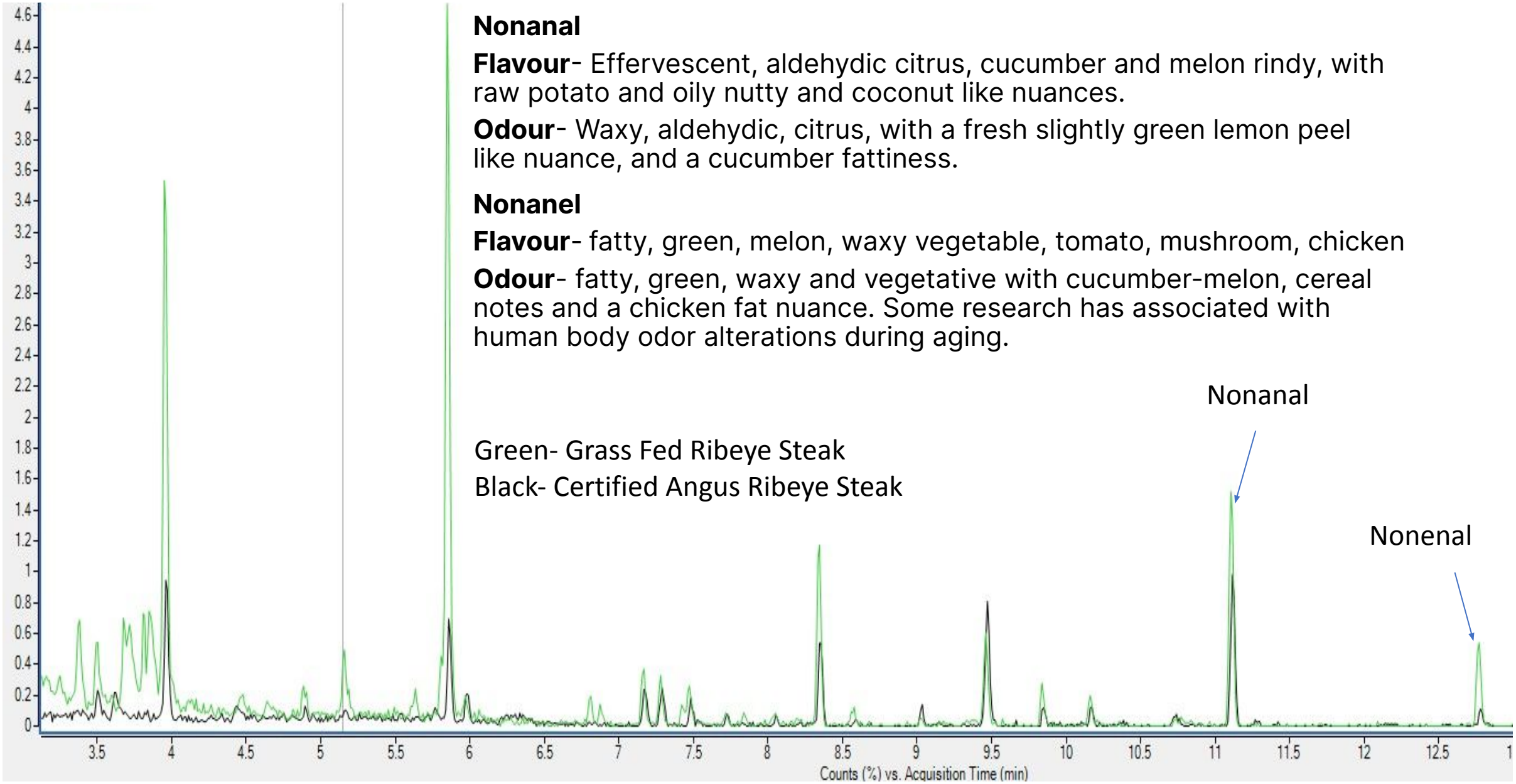
Flavour- Effervescent, aldehydic citrus, cucumber and melon rindy, with raw potato and oily nutty and coconut like nuances.

Odour- Waxy, aldehydic, citrus, with a fresh slightly green lemon peel like nuance, and a cucumber fattiness.

Nonanel

Flavour- fatty, green, melon, waxy vegetable, tomato, mushroom, chicken

Odour- fatty, green, waxy and vegetative with cucumber-melon, cereal notes and a chicken fat nuance. Some research has associated with human body odor alterations during aging.



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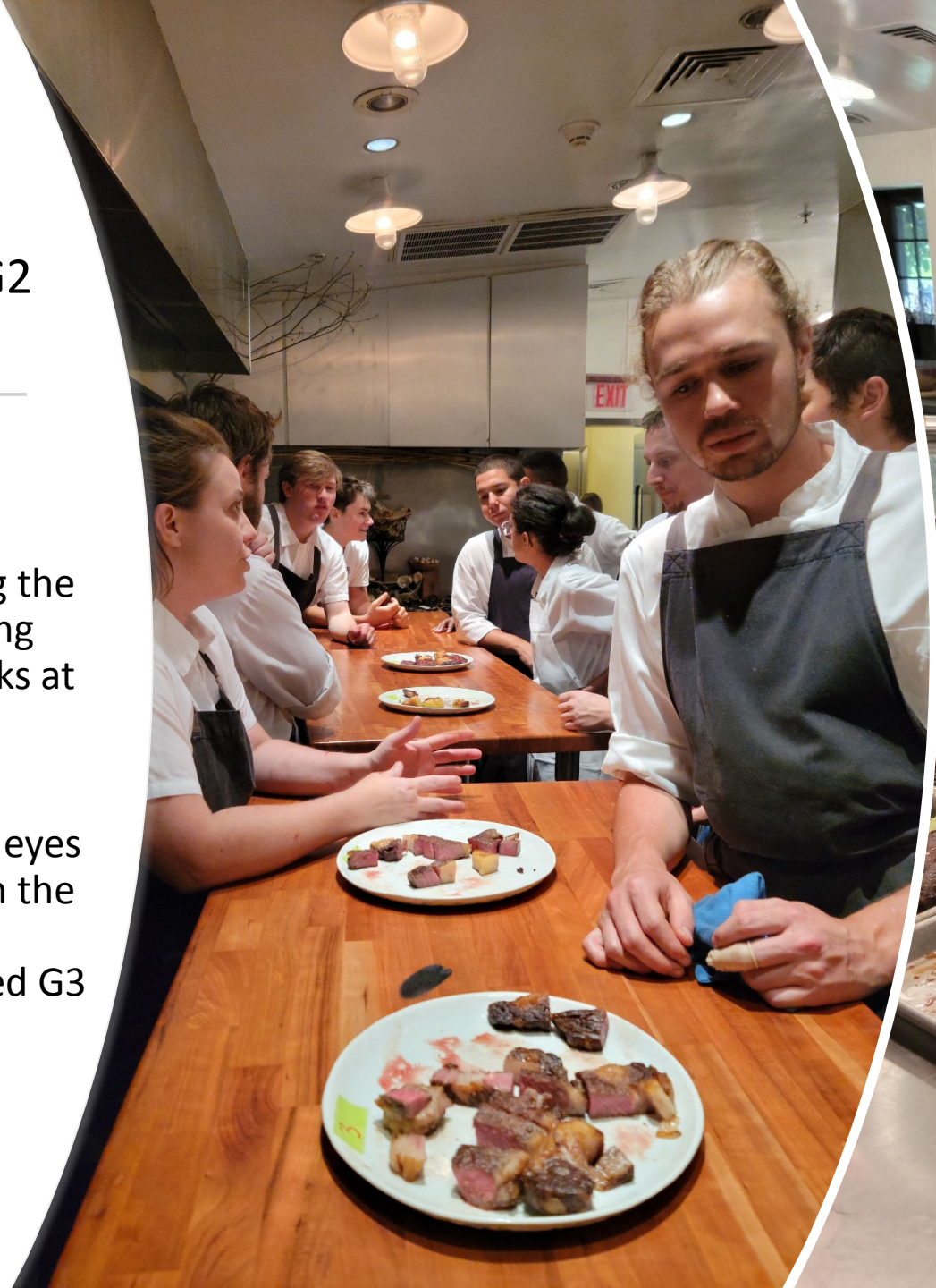
What did the chefs say about the 3- the G3 and G2 Rib Eye Steaks?

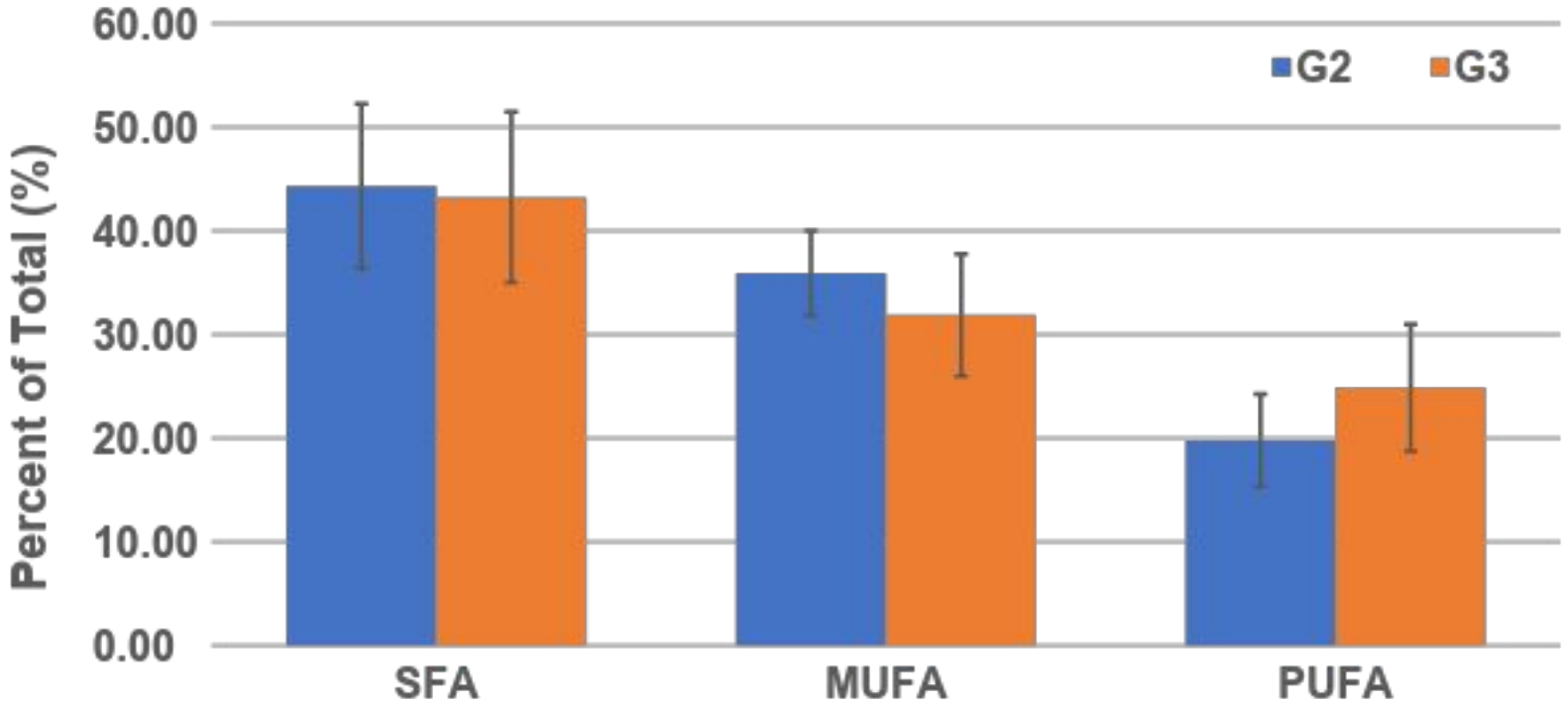
Thanks to Chef Nick for preparing the steaks and coordinating the tasting with the Blue Hill Restaurant cooks at Stone Barns (Pocantico Hill NY).

They thought the 3-Ranch G2 rib eyes were a little bit more tender than the G3 ribeyes. Over all for taste, tenderness, texture they preferred G3 number 5.



Fatty acid profiles – the major functional groups

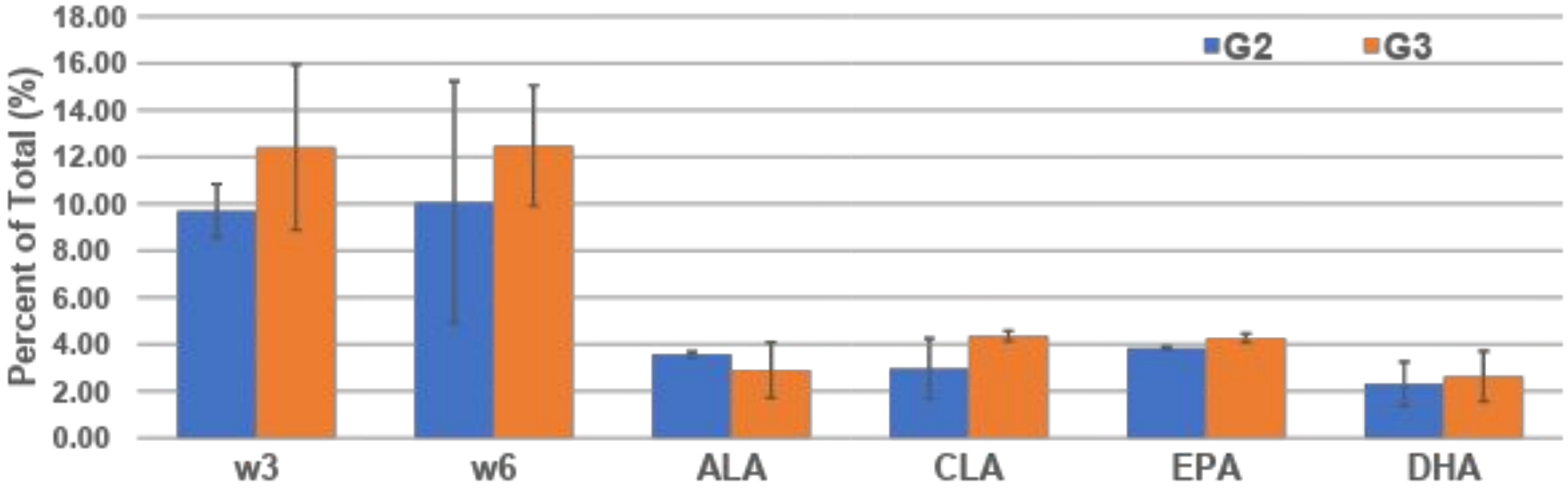
A comparison of the mean percentage of each functional group of fatty acids saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and polyunsaturated fatty acids (PUFA) (± se, n=3). 3- Ranch G2 beef is grass born and raised and TMR finished, G3 is grass always.



There is a trend towards having more SFA and MUFA in the G2, and for PUFA in the G3. This is consistent with the scientific literature demonstrating the changes in fatty acid profiles with multispecies pasture feeding compared with TMR (Total Mixed Ration).

Fatty acid profiles – the major functional groups

A comparison of the mean percentage of each functional group of polyunsaturated fatty acids omega 3 (w3) and 6 (w6), alpha linolenic acid (ALA), conjugated linoleic acid (CLA), Eicosapentaenoic acid (EPA), and Docosahexaenoic acid (DHA). ALA, EPA, and DHA are w3 fatty acids and CLA is an w6 fatty acid)(±se,n=3)



There was more EPA in the G3 (Grass born, raised and finished) compared with the G2 (grass born, raised and TMR finished) beef. CLA is a precursor to This is consistent with other research on how to differentiate grassfed beef from other beef (Daley et al 2010; Nogoy et al 2022).

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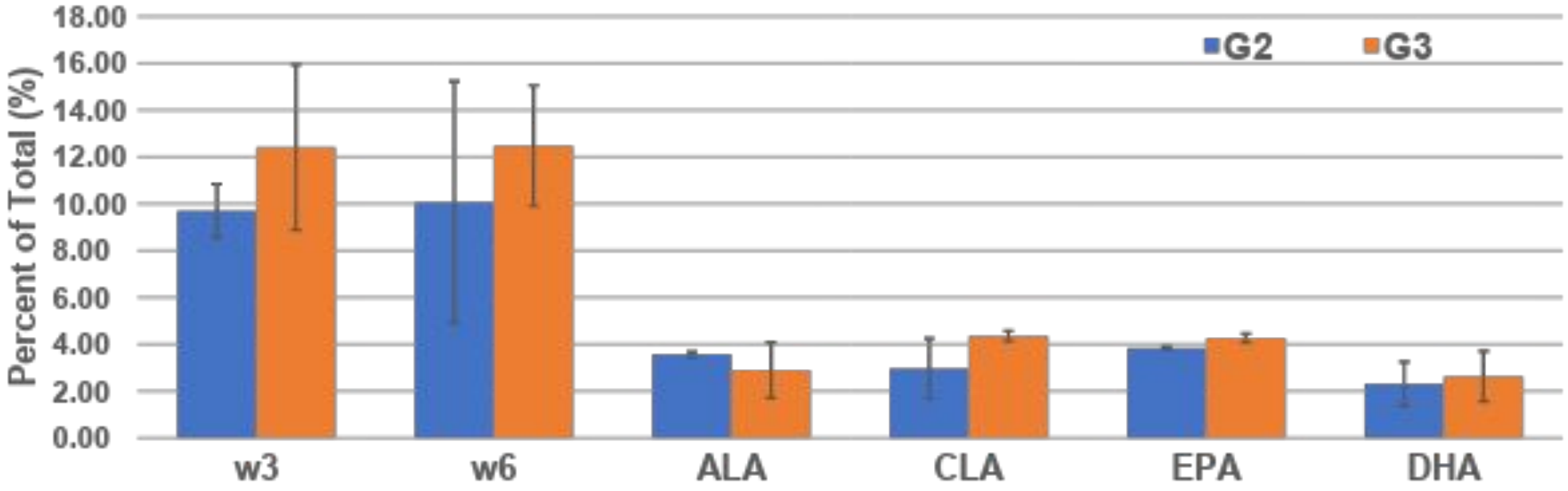

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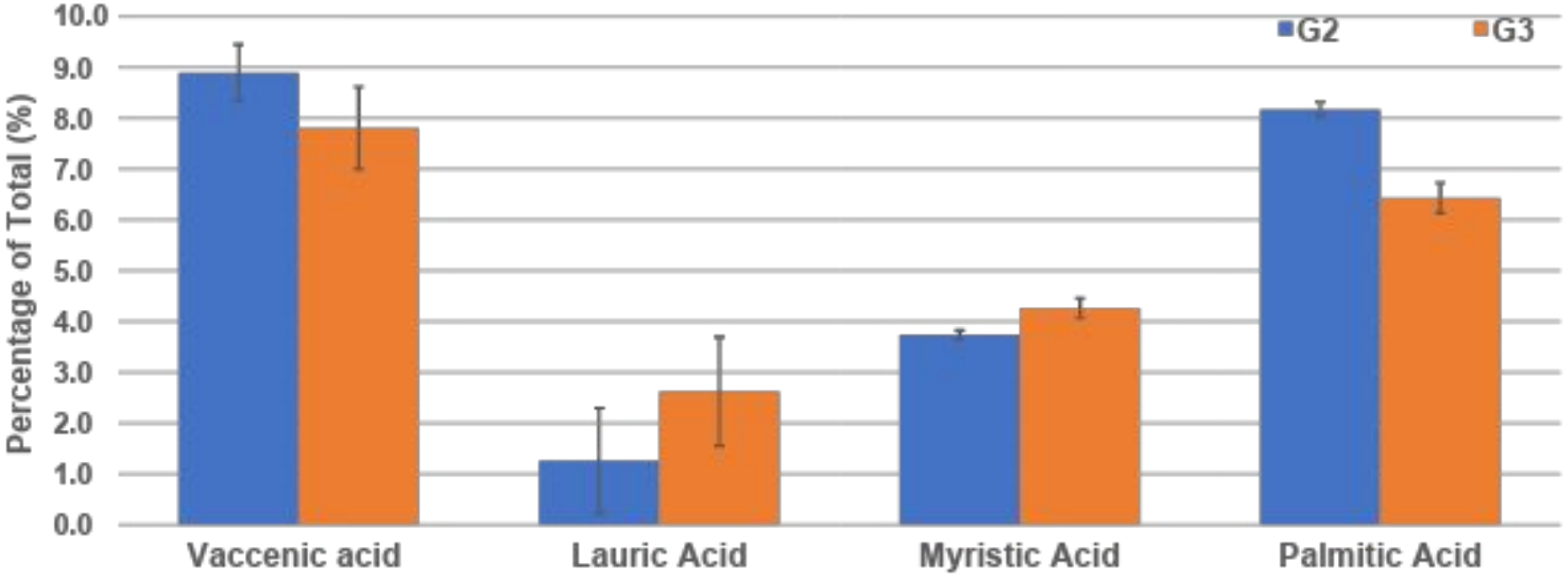
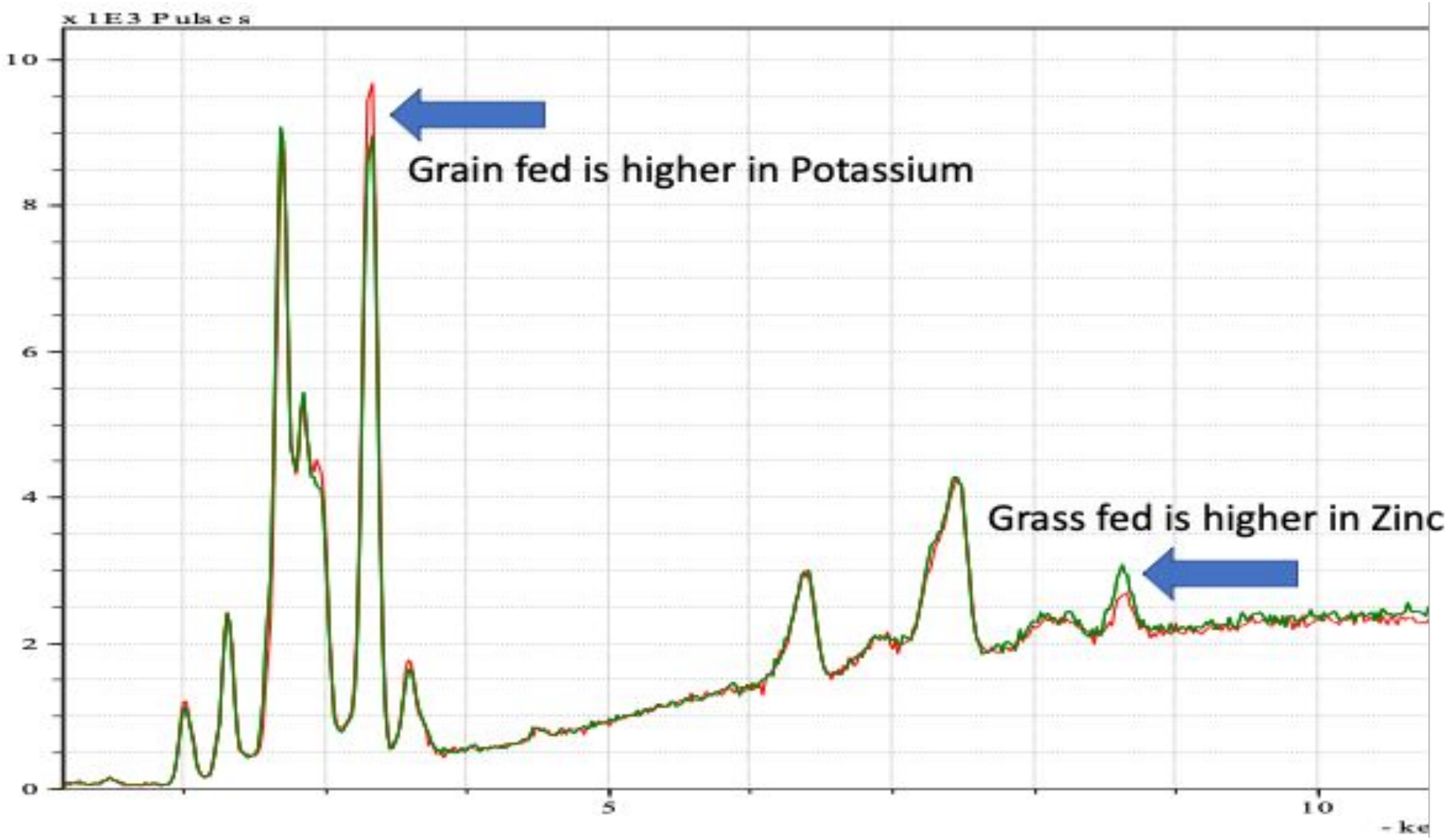
A comparison of the fatty acids that can have adverse or mixed affects on health.



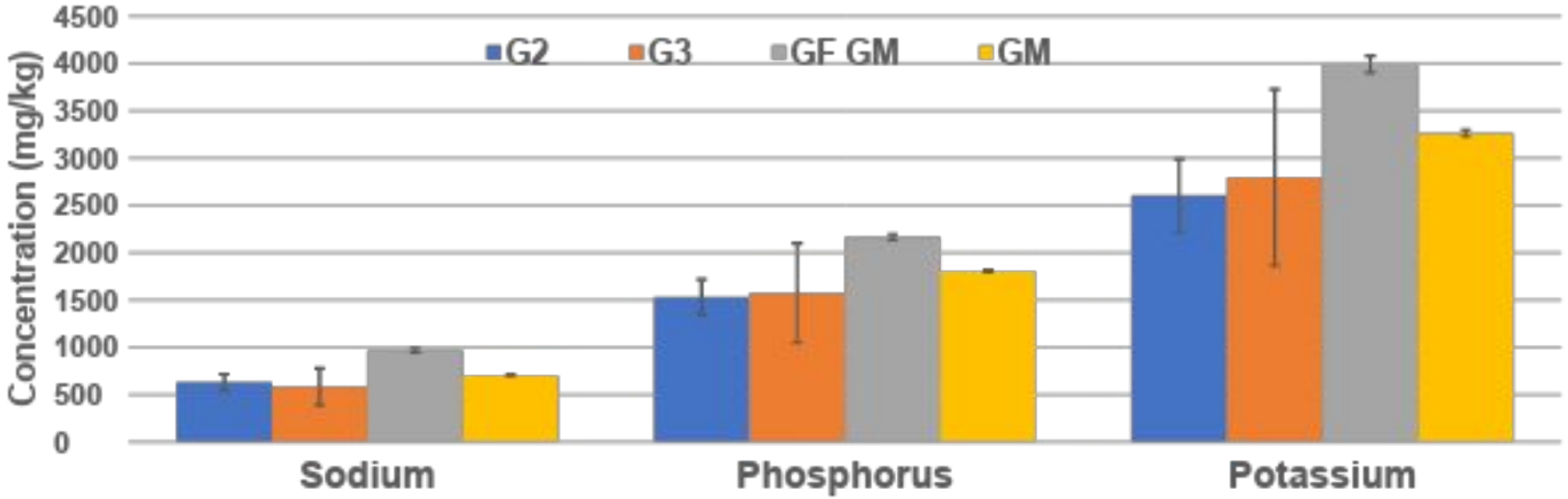
Vaccenic acid is a MUFA trans fat, Lauric, Myristic and Palmitic acids are all saturated fats (SFA) (± se, n=3). Myristic and Palmitic acids are known to elevate cholesterol. Lauric Acid can increase serum cholesterol but it also decreases the ratio of Cholesterol to HDL. Vaccenic acid (t-11) is a precursor to CLA. There is much to learn from the individual fatty acid.

X-Ray Fluorescent Spectroscopy (XRF) comparison of 2 store bought Ribeye steaks



ICP Analysis

A comparison of the mean concentration (mg/ kg fresh weight) (± standard error)(n=3) of Sodium (Na), Phosphorus (p) and Potassium (K) in 3- Ranch G2 (TMR finished), G3 (grass finished), Grass Fed (Store-wet pack) and in house ground meat (80/20).



There is statistically more Na and K in the GF GM than the other ground meats. The variation in the 3-Ranch G3 meat was significant indicating we needed more replicate animals (need to sell more beef), and that free choice for the animals creates variation in the meat.

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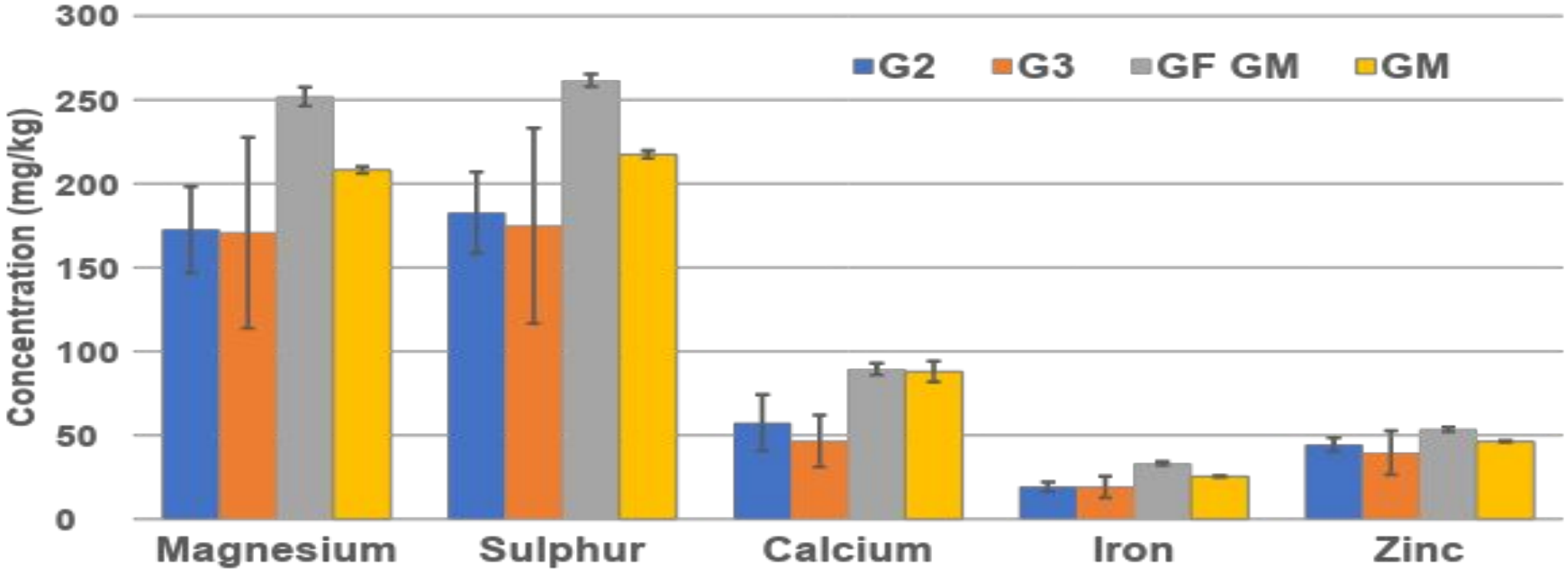

The GFGM ground meat had higher concentrations of Mg and S. The store bought meats both had higher concentrations of Ca, Mn, and Fe compared with the 3-Ranch ground meat. In the case of Fe wet packed or cryopacked meat has more blood in the package and therefore higher concentrations of Fe. The 3-Ranch meat was consistently low in Mn, and had a similar concentration of Zn to the other ground meat.

ICP trace minerals

Sample	Al (mg/kg)	Mn (mg/kg)	Cu (mg/kg)	Se (mg/kg)
G2	5.1 ± 1.3	0.19 ± 0.03	0.37± 0.03	0.13 ± 0.03
G3	1.1 ± 0.4	0.08 ± 0.03	0.36± 0.12	0.15 ± 0.05
GM GF	6.4 ± 0.3	0.16 ± 0.02	0.98 ± 0.05	0.19 ± 0.01
GM	6.7 ± 0.4	0.15 ± 0.001	0.62 ± 0.03	0.17± 0.001

The G3 ground meat had significantly less Aluminum (Al) and Manganese (Mn) compared with the other ground meats. The store bought meats and Bar3 G2 TMR –fed meat had higher concentrations of Al, and Mn. The tore bought meats (GM GR and GM) both had significantly higher concentrations of copper (Cu).

What we learned

- That 3 replicate cows was not enough to overcome the variability between animals and make scientifically sound conclusions.
  - it was a great start!
- The volatile organic compounds (VOC's) are worthy of more consideration given the big differences between grass fed, grain fed and TMR fed beef. These molecules are what make Grassfed – taste and smell unique.
- The G3 beef is richer in polyunsaturated fatty acids compared to the G2 beef, and has similar amounts of both SFA and MUFA. However, the composition of the SFA, MUFA and PUFA are different and favor the long-chain fatty acid that have well defined health benefits.
- There will be more to come as we complete all the analyses including amino acids and B vitamins

What we learned continued

There is still a lot of Carotenoids (the yellow colour precursors to vitamin A) in the fat of the animals that were finished on rations, and many similarities.

It was amazing to see how much the nutrient profile of the meat can change in a short time on a different diet.

The free choice of grass range fed beef means more diversity in taste and composition – consistent product needs to be considered at the same time as the nutrition.