TECHNICAL NOTE

SusCatt - Increasing productivity, resource efficiency and product quality to increase the economic competitiveness of forage and grazing based cattle production systems

Nutritional quality of pasture-fed beef

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Background

Many try to eat sustainably yet the necessary information may be lacking and often the environmental impact of food production dominates their consideration. The nutritional quality of the food we produce is also relevant and depends how we manage our farms - what our animals eat has a direct impact on the composition of their meat. This note focuses only on one aspect of beef's nutritional quality, although the Pasture Fed Livestock Association highlights other sustainability benefits offered by pasture-feeding, including: farm returns, animal welfare and environmental impact. In addition, SusCatt Technical Note 4.4.1 discusses consumer attitude to grass-fed.

A major weakness of many modern diets around the world is a shortage of long-chain omega-3 fatty acids (or n-3, including EPA, DPA and DHA), potentially one cause of numerous chronic physical and mental health conditions – hence the advice to eat oily fish. However lean red meat could be a reliable, alternative source, especially for those who rarely eat fish.

In theory, we can synthesise these deficient long-chain omega-3 fatty acids but the necessary metabolic pathway is thought to be swamped by excess omega-6 fatty acids (n-6) from our diets. So, if we are to enhance overall n-3 metabolism for consumers, the challenge is to reduce n-6, as well as increasing long chain n-3 in the meat we produce.

Aim

By comparing meat composition from different production systems, we know feeding cereals or cereal by-products to cattle diminishes n-3 and increases n-6 in meat but there is little evidence from cattle fed only forage throughout their life. In SusCatt we considered fat composition, looking at beneficial fatty acid profiles in steaks from 4 UK systems: non-organic, organic, certified pasture-fed and conservation cattle.

Sirloin steak. Photo: G. Butler

What did we do?

Non-organic and organic sirloin steaks were bought from 2 supermarkets during May and June 2019 and this was compared with steaks from cattle on 2 certified 100% pasture-fed farms, slaughtered over this time span. We also took the opportunity to include meat from cattle kept primarily for vegetation management to enhance biodiversity. Strictly speaking these conservation steaks were not directly comparable with the others in the study however it was a novel opportunity to investigate meat from these unusual systems. Some came from cattle slaughtered at different times in the year (which we know influences composition). Before analysis, all steaks were separated into subcutaneous fat (which has the option t0 be avoided by consumers) and muscle tissue, including marbling fat.

What did we find?

Reporting fatty acid profiles can get confusing due to the vast number of fairly specialised results generated. Full results have been

published (Butler et al 2021) but here we focus the most exciting aspect of our results - differences likely to influence the long-chain omega-3 supply from the steaks:

- sum of long-chain n-3 (EPA+DPA+DHA)
- α-Linolenic acid (ALA, C18:3, n-3) the precursor for long chain n-3 synthesis
- Linoleic acid (LA, C18:2) the main n-6 thought to block n-3 metabolism
- Relative concentrations of linoleic acid to α-linolenic acid (LA:ALA ratio), thought to control n-3 metabolism

The chart presents concentrations of these fatty acids and their ratios found in the muscle tissue from the 4 farming systems, with clear differences. Results confirm the concept that feeding concentrate feeds is detrimental to the potential for long-chain n-3 supply from meat - assuming non-organic beef production for supermarkets is more intensive than organic, which in turn is more intensive than pasture-fed (100% lifetime forage diets). This applies both in terms of the direct supply of n-3 but also the scope for metabolic synthesis by consumers, since it increases n-6 or LA content.

The concentrations of all n-3 are higher in steaks from extensive conservation and pasture production. System differences are less clear cut for LA content but the ratios relative to ALA range from around 2:1 for the beef from conservation and pastured cattle up to 7:1 for the non-organic beef. Results show meat from both these extensive forage-based systems in this study can legally claim to be 'a source of long chain omega-3 fatty acid' (unlike any of the steak sourced from the supermarkets) (as per: https://ec.europa.eu/food/safety/labelling_nutrition/claims/nutrition_claims_en). In addition, the bonus of a low ratio of LA to ALA is likely to enhance synthesis of more long chain omega-3 by consumers.

Steaks in this study were bought in early summer, probably from cattle finished on winter diets. We know, for many cattle, seasonal differences in feeding influences fat composition so the plan was to repeat the study in autumn, to judge the impact of summer diets. These steaks were bought, analysis started but then unfortunately Covid restrictions interveaned so we need to be patient and wait for these follow-up findings.

Conclusions

These results from SusCatt add to the evidence on the superior nutritional quality of meat from extensive farming, highlighting the benefits of forage only feeding. In addition, they show the scope for certified pasture-fed beef to avert consumer deficiencies in long chain omega-3 fatty acids intake.

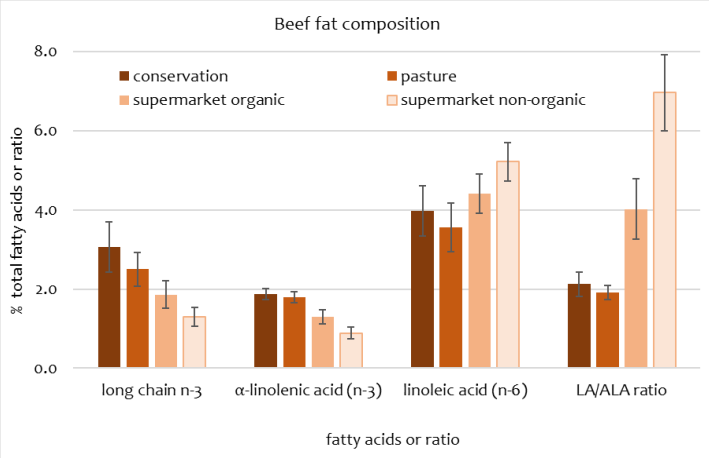

Chart: Mean concentration of fatty acids in muscle tissue (±standard error of means) in sirloin steaks from 4 production systems

Beef cattle at grass. Photo: Gillian Butler

Imprint

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