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Comparing the plasma polyunsaturated fatty acid (PUFA) profile of beef cattle fed on different finishing diets

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Abstract

Red meat is an important dietary source of protein and many other essential nutrients including omega(n)-3 polyunsaturated fatty acids (PUFA) which provide numerous benefits to human health. It is well known that grass-fed meat contains a more favourable fatty acid profile, compared to other feeding regimes, but the feasibility of grass finishing is in decline for many farmers/producers. Therefore, alternative methods to enhance the fatty acid profile of red meats, such as beef, are needed to meet increasing consumer demands for 'healthier' products. This study compared plasma PUFA concentrations across cattle finished on three different feeding regimes. Three farms supplied livestock to the current study, where cattle were fed three different feeding regimes for a minimum of 15-weeks prior to slaughter. Feeding regimes were ad lib concentrate (negative control), n3-enriched ad lib concentrate (treatment) or grass-fed only (positive control). Blood was collected at slaughter into EDTA tubes and plasma aliquots were stored at -80°C until analysis. A validated gas chromatography–mass spectrometry (GC-MS) method was used to quantify individual PUFA concentrations in mg/ml [linoleic acid (LA); arachidonic acid (AA); alpha-linolenic acid (ALA); eicosapentaenoic acid (EPA); docosapentaenoic acid (DPA); docosahexaenoic acid (DHA)]. Samples from 23, 49 and 40 animals (in control, treatment & grass groups, respectively) were available for the current analysis. One-way ANOVA tests revealed significant differences between groups in all PUFA concentrations quantified (all $P < 0.026$). Post-hoc (LSD) tests showed mean ± SD n3 PUFA concentrations were significantly different within all three groups (all $P < 0.04$), increasing from negative control (0.049 ± 0.013 mg/ml), to treatment (0.095 ± 0.034 mg/ml) and grass-fed groups (0.461 ± 0.132 mg/ml). The opposite was observed for mean ± SD n6 PUFA concentrations (1.060 ± 0.297 vs. 0.918 ± 0.267 vs. 0.355 ± 0.085 mg/ml, respectively; all $P < 0.02$). Cattle finished on either treatment or grass regimes had a more favourable n6:n3 PUFA ratio, compared to negative control (11.98 and 0.79 vs. 22.65, respectively). This study demonstrates that the finishing diet can impact plasma PUFA concentrations of beef cattle. Animals finished on the n3-enriched concentrate had, on average, double the total n3 PUFA concentrations, as well as an improved n6:n3 ratio, compared to control cattle. These results provide preliminary data on an alternative n3-enriched feeding regime for beef cattle to improve PUFA concentrations. Further research, however, is required to confirm if such beneficial changes are also observed in bovine muscle, which would have direct benefits for consumers.

Conflict of Interest

There is no conflict of interest