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Abstract

Higher Vitamin D2 and 25(OH)D2, but Not Vitamin D3 Metabolites, in Bovine Plasma and Muscle from Grass-Based Finishing System, Compared to Concentrate †

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Abstract: Meat and meat products are one of the largest contributors to vitamin D dietary intakes. Little is known, however, about how different animal husbandry practices and/or finishing diets might affect the vitamin D content of the animal. Therefore, this study aimed to investigate the effect of bovine finishing diet (grass vs. concentrate) on the 25(OH)D plasma concentrations of cattle and subsequent vitamin D content in beef. Cattle were fed grass (n = 7) or concentrate (n = 9) finishing diets for 15 weeks prior to slaughter. Bovine blood samples were collected at slaughter and plasma aliquots were stored (−80 °C) until analysis. Beef top rump from each animal was chilled for an ageing period of 21 days, then homogenised and frozen (−80 °C) until analysis. Bovine plasma samples were analysed for circulating 25(OH)D3, and 25(OH)D2 (nmol/L), and raw beef muscle (top rump) samples were analysed for vitamin D metabolites; vitamin D3, vitamin D2, 25(OH)D3 and 25(OH)D2 (µg/kg), all by LC-MS/MS. Total vitamin D activity was defined: [vitamin D3 + (25(OH)D3 × 5) + vitamin D2 + (25(OH)D2 × 5)]. Statistical analysis was conducted by SPSS with independent *t* tests used to compare groups; significance level $p < 0.05$. Data were presented as mean ± SD. A significantly higher plasma 25(OH)D2 concentration was observed in the grass finished cattle compared to the concentrate group (43.18 ± 11.75 vs. 16.56 ± 1.58 nmol/L, $p < 0.002$). No difference in plasma 25(OH)D3 concentrations was observed between groups. In beef top rump, the grass finishing diet resulted in a significantly higher mean ± SD vitamin D2 [0.07 ± 0.05 vs. 0.01 ± 0.01 µg/kg] and 25(OH)D2 [0.70 ± 0.16 vs. 0.25 ± 0.07 µg/kg] compared to concentrate finishing diet (both $p < 0.001$). Moreover, beef from grass finished cattle demonstrated a significantly higher total vitamin D activity compared to those in the concentrate group [9.52 ± 2.43 vs. 6.78 ± 2.00 µg/kg, $p < 0.05$]. No difference was observed for muscle vitamin D3 or 25(OH)D3 between groups. In conclusion, a more favourable bovine vitamin D profile, driven by vitamin D2 metabolites specifically (not vitamin D3), is reported from a grass-based finished system, compared to concentrate finishing. Further research is required to understand the impact of these findings for both agriculture practices and human nutrition.

Keywords: vitamin D2; 25(OH)D2; beef; Grass-based finishing system

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