Carcass distribution of phospholipids in grass-fed Wagyu.

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Abstract – Beef contains reasonable amounts of phospholipids, however little is known about the content of these lipids in grass-fed Wagyu. We examined the concentrations of phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylinositol (PI), phosphatidylserine (PS) and sphingomyelin (SM) in *Longissimus lumborum* (striploin), heart, kidney, liver, lung, spleen, and brain obtained from grass-fed Wagyu. We found that brain had the highest concentration of phospholipids, followed by liver. This work will be used to direct research to examine the impact of diet (e.g. grass *versus* feed concentrates) and beef breed.

Key words: Wagyu, grass-fed beef; lipids

I. INTRODUCTION

Phospholipids play crucial roles in many aspects of human health, particularly in the cardiovascular system [1, 2]. Phospholipids are typically associated with cellular membrane lipids, including those surrounding muscle fibres. Phospholipids are divided into two groups: glycerophospholipids and sphingolipids [3]. The main phospholipids are phosphatidylinositol (PI), phosphatidylethanolamine (PE), phosphatidylserine (PS) phosphatidylcholine (PC), and sphingomyelin (SM). There is increasing awareness of the impact of dietary phospholipids on human health, especially those derived from dairy or eggs [4, 5]. While beef contains reasonable quantities of PL [6], little is known of their distribution across the carcass. Wagyu beef produces a well-marbled meat, and is likely to contain high concentrations of phospholipids for this reason. Therefore, we characterised the location and quantity of phospholipids composition in grass-fed Wagyu beef.

II. MATERIALS AND METHODS

Five Wagyu-dairy cross carcasses (291 ± 21 kg; Aus-Meat marble score 7-8, with 9 being maximal) were processed into *Longissimus lumborum* (striploin), heart, kidney, liver, lung, spleen, and brain. The samples were frozen, freeze-died and ground. Phospholipid concentrations were determined by High Performance Liquid Chromatography coupled with Evaporative Light Scattering Detector (HPLC-ELSD) as modified from Reis *et al*. [7]. Data were analysed using a Linear Mixed Model, using Cut as the fixed effect and Carcass as the Random effect in Genstat (2015; Version 18.1.0.17005).

III. RESULTS AND DISCUSSION

The concentrations of phospholipids in the Wagyu-dairy cross carcass are shown in Table 1. There was a significant effect of cut, with the brain having the highest concentrations of all phospholipids with the exception of PI, which was not detected. The liver was the second most abundant source of phospholipids. Phosphatidylcholine, followed by PS and SM were generally the most abundant over all cuts of meat. The values presented here are similar to those published in the literature, with little evidence that there is a markedly altered pattern in the Wagyu breed [8].

Table 1. Concentrations (mg/kg fresh weight) of phosphatidylinositol (PI), phosphatidylethanolamine (PE), phosphatidylserine (PS) phosphatidylcholine (PC), and sphingomyelin (SM) and total phospholipids in the Wagyu carcass.

Cut	Striploin	Heart	Kidney	Liver	Lung	Spleen	Brain	SEM	P-value

PI	216	159	82	93	0	23	0	16	0.001
PE	840	1173	799	866	336	593	2674	244	0.001
PS	159	109	144	233	153	251	1093	113	0.001
PC	1490	1520	1239	7275	1587	862	8403	731	0.001
SM	209	219	789	656	1028	595	5415	254	0.001
Total	2913	3181	3037	9122	3105	2324	17585	713	0.001

Total = PI+PE+PS+PC+SM

IV. CONCLUSIONS

These results confirm that phospholipids are present at high concentrations in grass-fed Wagyu. This work will be used to direct research to examine the impact of diet (e.g. grass versus concentrate) and beef breed on the composition of phospholipids in beef. Ultimately, we will assess the impacts of beef-derived phospholipids on human health, as part of on-going research.

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