



Volatile Compounds of Lamb *Longissimus* and *Semimembranosus* from Australia, New Zealand, and the United States

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Objectives

Differences in production practices based on country of origin create distinct differences in palatability of lamb from both the loin and the leg. The objective of this study was to identify volatile compounds which influence flavor across lamb leg and loin chops sourced from three countries of origin.

Materials and Methods

Lamb loins (IMPS #232 1 × 1; $n = 30$ /treatment) and legs (IMPS #233A; $n = 60$ /treatment) were sourced from Australia (AUS), New Zealand (NZ), and the United States (US). Product was fabricated to isolate the *longissimus lumborum* (LL) from the loins and the *semimembranosus* (SM) with *adductor* from the legs. Muscles were trimmed of external fat and connective tissue and fabricated into 2.54-cm thick chops, vacuum packaged individually, and frozen. A subset of samples ($n = 15$ /treatment) for volatile compound analysis were thawed at 2–4°C for 24 h, cooked to a medium degree of doneness, frozen, and powdered. Volatile compounds were extracted via SPME from powdered samples and analyzed using GC–MS. Data were analyzed as a 2 × 3 factorial design with muscle, country of origin (COO), and their interaction as fixed effects with a significance level of $\alpha = 0.05$.

Results

Differences in volatile compounds of all classes were largely related to COO. Of the 36 lipid-derived compounds, 18 were affected by COO ($P < 0.05$) and 11 were affected by the interaction of muscle and COO ($P < 0.05$). Where the interaction was significant, US LL and SM samples generally produced greater concentrations of volatile compounds than other treatments ($P < 0.05$), especially

in compound classes including alcohols, *n*-aldehydes, and ketones. Of the alkanes evaluated, only pentane was greater in US samples compared to other samples ($P < 0.05$) and was more than double the concentration produced in NZ and AUS samples. Alkenes did not follow the general trend of being increased in US samples. P-xylene was elevated in SM samples compared to LL samples ($P < 0.01$), and toluene was greater in NZ samples than US and AUS samples ($P < 0.05$). D-limonene was decreased in AUS samples compared to US and NZ samples. Of the 18 Maillard-derived compounds identified, 13 were affected by COO ($P < 0.05$), 3 were affected by muscle ($P < 0.01$), and 3 were affected by the interaction of COO and muscle ($P < 0.05$). Of the Strecker aldehydes, 3-methylbutanal and 2-methylbutanal were both affected by both COO ($P < 0.01$) and muscle ($P < 0.05$). US samples produced the greatest concentration of these compounds ($P < 0.05$) and AUS samples produced the least ($P < 0.05$). Samples from LL produced more of these compounds than SM samples ($P < 0.05$). Ketones including acetoin and 2,3-butanedione, which contribute positively to flavor in meat, were highly elevated in US samples compared to AUS and NZ ($P < 0.05$). Sulfur-containing compounds were generally greater in non-domestic product than US samples, except for dimethyl sulfide, which was greatest in US SM samples and least in NZ LL and AUS SM samples ($P < 0.05$). Pyrazines were generally elevated in NZ samples compared to AUS samples ($P < 0.05$), with US samples intermediate ($P > 0.05$).

Conclusion

Country of origin is a strong influencer of flavor compounds in lamb. This is likely attributable to global differences in production system including, but not limited to, diet, genetics, sex, and postmortem handling and will influence the perception of flavor by consumers.