

ABSTRACT

A comparison of fat composition of Japanese and long-term grain-fed Australian steers

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Subcutaneous and intermuscular fat samples were collected from carcasses of four major breeds of steers in Japan: Wagyu, Wagyu × Angus, Dairy and Murray Grey. For comparison, we also collected subcutaneous fat samples from carcasses of long-term grain-fed (350–455 days) Angus, Jersey and Angus × Hereford steers, and short-term grain-fed (70–100 days) Murray Grey steers in Australia. Fatty acid profiles were determined on all samples and triacylglycerol composition, thermal properties, fat cell size and lipid and connective tissue contents were determined on representative samples. Compared with the Japanese samples which were soft to very soft when assessed subjectively, samples of Australian fat were generally hard and somewhat fibrous in appearance. These tactile and visual differences in the hardness of the subcutaneous fat between the Japanese and Australian beef were confirmed by the physical and chemical properties determined. Markedly different melting patterns were observed for the Australian and Japanese fat samples. The Japanese fat had considerably less saturated and more unsaturated fatty acids resulting in much higher unsaturated/saturated ratios (1.9) compared with the Australian samples (1.0). This resulted primarily from the high contents of oleic and palmitoleic acids and the low content of stearic acid of the Japanese samples. The triacylglycerols from the Japanese fat had considerably less tri-saturated and di-saturated fatty acids and more di-monounsaturated and tri-monounsaturated fatty acids in their structure. Differences were observed when the Japanese subcutaneous fat samples were grouped by their meat quality grades. From Grade 5 to Grade 2, there was a significant decrease in marbling score (9.3 to 2.5) and in the ratio of palmitoleic to stearic acid (1.7 to 1.2) and an increase in the connective tissue content (1.5 to 2.1%). Compared with subcutaneous fat, intermuscular fat had a higher content of saturated and a lower content of unsaturated fatty acids resulting in a lower ratio of unsaturated to saturated fatty acids and of palmitoleic to stearic acid. It was concluded that the fatty acid composition and the triacylglycerol structure of fat plays the predominant role in determining the lustre, texture and properties of fat desired by the Japanese market: the soft character of fat from Japanese cattle results primarily from its low content of stearic acid and consequent lower melting temperatures. Fat cell size and the lipid and connective tissue contents of fat appear to be less important.