

Effects of dairy lamb rearing system and slaughter age on consumer liking of meat and its association with lipid composition

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Objectives: The objectives of the present study were to evaluate the effects of dairy lamb rearing system (RS: natural or artificial) and lamb slaughter age (SA: 3-wk milk-fed or 3-mo pasture-fed) on New Zealand consumers' liking of meat, and its relationship with total and individual meat fatty acids content.

Materials and Methods: A randomized experimental design with 48 twin-born East-Friesian cross male lambs born within a 10-day period were randomly allocated to 1 of 2 treatments: natural rearing on their dam in an outdoor pasture grazing system (n=24; NR), or artificial rearing (n=24; AR). Lambs assigned to the NR group were moved with their ewe into one of 3 ryegrass/white clover mixed pasture paddocks with similar numbers of animals per paddock. Lambs assigned to the AR group were removed from their dams and transferred to one of 4 indoor lamb rearing pens (n=6/pen) and offered 100% bovine milk protein and fat milk *ad libitum*. At 3 weeks of age, 6 animals per treatment were randomly selected from each AR pen (n=4) or NR paddock (n=2) and sent for slaughter at a commercial abattoir (3-wk milk-fed). Lambs in one of the NR paddocks did not reach the minimum weight criteria for slaughter, hence this paddock could not be included in the 3-wk milk-fed. The remaining lambs in the AR and NR groups, were reared until ~6 weeks of age and then weaned off milk and managed as a single mob thereafter on a ryegrass/white clover mixed pasture until slaughter at 3 months of age. At 24 h *post-mortem*, both loins (*M. longissimus lumborum*, LL) were collected from each animal (n = 48) for total and individual fatty acids determination, and for consumer panel evaluation. The consumer evaluation was done on twelve sessions, with 11-12 consumers per session. Consumers (n=133) rated liking of flavour, juiciness, tenderness, and overall liking using a 100 mm non-structured line scale anchored at each end (0: dislike extremely to 100: like extremely). Data were evaluated using a split-plot design including the RS effect as main plot, SA effect as the sub-plot and their interaction as fixed effects. Intramuscular fat (IMF) was included as a covariate in the consumer data analyses. Consumer clusters based on their overall liking scores were generated and analysed including cluster and its interactions as fixed effects in the above model. Correlations were evaluated between consumer liking scores and the meat fatty acids.

Results and Discussion: The IMF content was not influenced by the RS, the SA or their interaction ($P > 0.90$; $2.75 \pm 0.70\%$). The lack of SA effect on IMF could be associated with fat mobilization at weaning. The IMF content was similar to that reported for lambs of meat breeds slaughtered between 3 and 8 months. No RS by SA interaction was observed for fatty acid composition ($P > 0.05$), and only few RS effects were observed. Potentially associated with the type of milk consumed, C14:1 proportion was higher ($P < 0.001$), while C18:1 *trans*-11 (TVA) and C18:2 *cis*-9, *trans*-11 (CLA) proportions were lower ($P < 0.05$) in meat from AR than from NR lambs. Despite the similar IMF content, 15 of the 25 fatty acids evaluated were affected by the SA of the lambs. Increasing SA reduced total and individual PUFAs proportions but did not affect C18:3 n-3 proportion. This can be associated with the poor rumen fermentation capacity of the younger lambs. The SA significantly influenced but the RS had no impact ($P > 0.10$) on consumer liking of lamb. In general, the overall liking and the liking of tenderness and juiciness were higher ($P < 0.01$) for meat from the younger lambs, but flavour liking did not differ ($P > 0.95$). When consumers were clustered based on their overall liking scores, a group of consumers preferred the meat from the 3-wk milk-fed lambs (Cluster-1; 60% of all consumers), whereas another group preferred the meat from the 3-mo pasture-fed lambs (Cluster-2, 40%). Consumers in Cluster-1 preferred meat from younger lambs mainly because they liked its tenderness and juiciness. In contrast, consumers in Cluster-2 preferred meat from older lambs because they liked its flavour. Flavour liking was associated with meat fatty acid profile in Cluster-2, but minimally in Cluster-1.

Conclusions: Lamb slaughter age had a stronger influence on the fatty acid composition of meat than the rearing system. Lamb slaughter age but not the rearing system influenced meat sensory properties. Most consumers preferred meat from the 3 wk milk-fed lambs than the 3 mo pasture fed lambs. Two consumer clusters were generated, one cluster preferred meat from 3-wk milk-fed lambs mainly driven by its tenderness, juiciness and milder flavour; while the other cluster preferred meat from 3 mo pasture-fed lambs mainly driven by its stronger flavour.

Key words: Rearing system, Slaughter age, Fatty acids, Overall liking, Flavour liking