EFFECT OF FEEDING A MILK DIET OR CONCENTRATE PLUS HAY DIET ON CARCASS AND MEAT QUALITY OF LAMB

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SUMMARY

The object of this study was to compare carcass and meat quality characteristics of conventionally reared lambs with others reared solely on milk. Eighteen cross-bred lambs weaned at 5 weeks of age, were randomized within each sex into 2 groups. The first group was fed reconstituted whole milk and the second, commercial lamb pellets and hay. Both diets were offered ad lib. for 9 weeks. Animals were subsequently slaughtered under standard commercial conditions. Samples of shoulder joint were taken for dissection and meat quality assessment was made using the 6 - 12th rib section of the longissimus dorsi muscle.

Lambs on the concentrate and hay diet had significantly larger reticulo-rumens, livers and generally were less fat($P < 0.01$) than milk-fed lambs. Dietary treatment had little effect on meat quality but did affect fatty acid profiles of the subcutaneous fat. The milk diet did not appear to produce the typical pale "veal" colour in lambs as might be expected from studies on veal production.

Introduction

Veal is produced by intensively rearing calves on a milk diet and slaughtering them for meat at the age of 16 weeks or less. The characteristic light pink colour of veal is judged by the customer to be a guarantee of exclusive milk feeding which is associated with specific organoleptic quality (Charpentier, 1970). The light pink colour actually reflects an anaemic condition resulting from the low iron content of milk (Blaxter *et al.* 1957). However, access to roughage produces a darker veal colour. Milk-fed calves have been found to be fatter (Seewald and Eichinger, 1987) and produce veal with higher drip losses, but no differences in sarcomere length or shear force (Smulders and Visser, 1987).

The object of this study was to examine the carcass and meat quality characteristics of lambs reared on a milk diet in comparison to lambs reared following a concentrate - and roughage - based diet.

Materials and methods

Animal rearing and slaughter

Eighteen 5 - week - old Grey x Dutch Texel crossbred lambs comprising of 12 females and 6 males were randomized within each sex into 2 groups. The first group was fed reconstituted whole milk (1 part dry powder to 6 parts warm water) and the second, commercial lamb pellets and hay (subsequently referred to as "milk" and "roughage" diets). Both diets were offered *ad lib.* for 9 weeks. Lambs were subsequently slaughtered in a meat factory under conventional factory conditions. The reticulo-rumen and liver were collected. The reticulo-rumen was cut open, the ingesta washed out under running water and hung on a rail until it no longer dripped water. The weights of the liver and washed reticulo-rumen were noted. The initial pH (pHi) was measured on the 9th rib region of the *longissimus dorsi* muscle (LD) at 45 min. post slaughter using a spear point probe (Orion 8163 Ross™ Combination pH electrode) connected to a portable pH meter (Re 357 Tx Microprocessor

pH meter, EDT Instruments). Carcasses were held at 1 - 3 °C until analysed. The shoulder of each carcass was removed and physically dissected into lean, fat and bone.

Meat quality determination

Meat quality measurements were made on the 6 - 12 rib section of the LD. Reflectance spectra were assessed after 24 h post mortem using the Monolight Spectrophotometer Model 6800 Controller fitted with a 0/45° reflectance head (Monolight Instruments, Weybridge) Samples for sarcomere determination were fixed in 5% gluteraldehyde solution (Koolmees *et al.* 1986) and measured using the laser diffraction technique (Cross *et al.* 1981). Ultimate pH (pHu) was assessed by measuring the pH of 1 g muscle samples homogenised in 10 ml distilled water. A sample of approximately 100 g was cooked at 80 °C for 60 min. and the percentage loss on cooking noted. Six cores of diameter 1.4 cm, drilled along fibre long axis, were obtained per sample and tranversely sheared using Warner - Bratzler equipment mounted on an Instron Universal Testing Machine.

Fatty acids analysis

Samples of subcutaneous fat were obtained from the midline area of the 9 - 12th rib section of each carcass. Fat was extracted following the method of Folch *et al.* (1957) and methylated according to method 6 of B.S. 6844 (1980). Fatty acids profiles were determined using the Varian Star 3400 Gas Chromatograph equipped with a capillary silicon based column, CP-SIL 88 (Chrompack, The Netherlands).

Statistical analysis

Treatment means were calculated for each parameter and compared for significant differences using the t test.

Results and Discussion

The large difference in mean reticulo-rumen weight between lambs fed the different diets (322.8 versus 902.3 g) shows that rumens of milk fed lambs were relatively underdeveloped (Table 1). It is known that the inclusion of concentrate and roughage in the diet of young ruminants results in faster development of the rumen (Church, 1976). The significantly ($P < 0.01$) fatter carcasses from milk than roughage diets is in agreement with similar studies in cattle (Seewald and Eichinger, 1987). There were no statistically significant differences in pHi, pHu, cooking loss, sarcomere length and shear force ($P > 0.05$). Milk feeding did not result in significantly paler meat than roughage feeding, as is generally the case in cattle. The ability to produce pale veal is inversely related to liver iron concentration (St. Laurent and Brisson, 1968). Since the concentration of iron in the liver of lambs are higher than in calves (Holland *et al.* 1991), lambs may be more tolerant of low iron diets than calves.

The fatty acid profiles of the back fat of lambs fed the milk and roughage diets were significantly different in all fatty acids except linoleic acid, $C_{18:2}$ and arachidic acid, $C_{20:0}$ (Table 2). In general, the back fat of lambs fed the milk diet were less saturated ($P < 0.05$) and contained smaller percentage of polyunsaturated fatty acids ($P < 0.05$) but more monounsaturated fatty acids ($P < 0.001$) than lambs fed the roughage diet. The large differences in fatty acid contents between lambs on the two treatments reflect differences in reticulo-rumen form and function and composition of the diets offered each group. The type of feed offered to a ruminant affects the pattern of rumen fermentation, which in turn affects the composition of fat in fat depots (Duncan *et al.* 1974; ørskov *et al.* 1975).

Conclusion

Milk feeding resulted in significantly fatter carcasses, but did not produce the expected pale "veal" colour. The fatty acids of the back fat of milk-fed lambs were less saturated, and generally resembled those of milk. Futher work is required to examine the role of iron in the colour of milk-fed lambs in comparison to the studies on veal.

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