

SENSORY QUALITY OF LAMBMEAT OF RAMS AND WETHERS AT DIFFERENT AGES

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Background

There is not much scientific literature on the odour / flavour of meat from ram lambs and the research results are conflicting. Misock et al. (1976.) and Crouse et al. (1981) both found that meat from rams had stronger and more undesirable odour than meat from wethers. The lambs were old and the rams showed characteristics of sexual development. Kirton et al. (1983) found ram flavour to be preferred even in old animals. Dransfield et al. (1990) found no difference in the eating quality of meat of rams and wethers from twin lamb at the age of about 140 days. Rousset-Akrim et al. (1997) found a difference between the sensory properties of 90 and 200 days old ram lambs that was also reflected in the amount of branch chain fatty acids (Young et al., 1997) but it was not possible to separate the effects of age and puberty in that experiment.

The specific odour and flavour of lambmeat is linked to methyl-branched fatty acids (Wong et al. 1975). The branch fatty acids increase with age and more in entire rams than castrates (Brennard and Lindsay, 1992, Garton et al., 1972, Duncan and Garton, 1978, Ha and Lindsay, 1991). Busboom et al. (1981) showed that fat of ram lambs at around 300 days had higher concentrations of branch fatty acids than castrates and also a softer fat. Sutherland and Ames (1995) studied meat of 12-weeks old rams and wethers and found the branch short chain fatty acids at higher levels in the adipose tissue from entires than from wethers

"Ram taint" is considered to be a problem in the production of lambmeat in Iceland when the ram lambs reach sexual maturity. In Iceland the puberty of rams starts developing at the age of 140 - 170 days. The classification rules for ram lambs slaughtered late in the autumn are not categorised as lamb but as old rams. This is based on experience and tradition but not on research. There is a growing interest for fresh lambmeat production in Iceland, which means that lambs are now slaughtered at a higher age which makes ram lamb production difficult because of the development of puberty. In a preliminary study there was no difference in the sensory quality of meat and fat of ram lambs slaughtered at the age of 120 - 250 days (Valdimarsdottir and Thorkelsson, 1996). This puts the question of "ram taint" into a new perspective and it must be scientifically proved with sensory analysis before castration is considered an option.

Objectives

The aim of the study was to find the effect of age of entire rams and castrated rams (wether) on odour, flavour, meat tenderness and juiciness on lambmeat.

Methods

Twenty twin ram lambs were in the experiment. One of the twin was castrated just after lambing in May and the other left entire. Four twin lambs were slaughtered at 5 different ages, 165, 185, 200, 215 and 240 days of age. Another 8 lambs, 4 rams and 4 ewe lambs were selected to represent the most common slaughter age of about 140 days. All lambs were grazed on natural and cultivated pasture comprising of grass until the age of 135 days. After that they were grazed on forage for a month and then taken indoors and fed dry hay until slaughtered.

The muscle of *M. longissimus lumborum* with overlying subcutaneous fat was vacuum packed and aged for three days at 2°C before freezing at -20°C. After a storage period of 2-5 months the meat was thawed and cooked under a grill to an internal temperature of 68°C. The meat and fat was assessed by a trained sensory panel composed of ten persons using a descriptive test. Each assessor received a 20 mm thick slice of meat with fat which was kept warm on hot plates, in all 48 samples in duplicate. The meat and fat was scored on a scale from 0-100 for odour and abnormal odour of the lean and fat (nothing to very much), tenderness (very tough to very tender), juiciness (no juice to very juicy), sheepmeat flavour, livery, rancid, fatty and off-flavour of meat (nothing to very much).

The statistical analysis was carried out with the Number Cruncher Statistical Software CS 6.0.21, 1996 using the GLM-procedure where the effects of lamb treatments and judges were taken into account. The Duncan's test was used to compare data between individual treatments.

Results and discussion

There was a 100 days age difference between the youngest and oldest lambs in the experiment. This difference did not have a significant effect on the carcass weight (Table 1). Scores for lamb fat odour was similar for all treatments (Table 2). This was even true for the odour intensity of the fat of 200 days rams lambs that had reached puberty. It had the same odour intensity as the fat from wethers at the same age. But the muscle of the rams at that age had significantly higher abnormal odour than muscles from other



treatments. The abnormal odour of lean was virtually the same for all groups and was lowest in rams at the age of 140 days and rams and wethers of 165 days.

The meat of rams was tougher than the meat of the castrate twins, except for the age groups of 200 and 240 days. The meat of ewe lambs was found to be the most tender of all. Sheepmeat flavour was quite similar in all groups apart from some small differences which did not seem to have an obvious pattern. Ewemeat was remarked as having the strongest livery flavour. Livery flavour has been associated with very old ewes (8 years) due to endogenous enhanced proteolytic activity¹⁰. Abnormal flavour of the lean was highest for wethers at the age of 240 days and rams of 140 and 200 days. High abnormal flavour of lean was linked with a high abnormal odour of lean except for the ewe group where abnormal flavour of lean was low and abnormal odour of lean was high.

Conclusions

The slaughter age and castration did not have a decisive effect on the sensory quality of the meat. The age and sex had some effect on the tenderness. The most tender meat is the youngest group of ewe lambs. Abnormal odour of fat was not detected in older rams. Abnormal odour and flavour of the lean was strongest in the groups of 200 days old rams and in wethers of 240 days. Abnormal flavour of the lean was also high in the youngest ram group of 140 days even though they were within the onset of puberty.

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TABLE 1. Average carcass weight of lambs in each treatment.

	Age at slaughter (days)												Level of significance
	140		165		185		200		215		240		
	Ewe	Ram	Wether	Ram	Wether	Ram	Wether	Ram	Wether	Ram	Wether	Ram	
Weight, kg	15,1	17,9	14,5	15,4	15,4	17,4	14,8	18,0	15,0	16,4	15,5	16,3	NS
SD	2,3	5,4	2,3	3,2	2,7	1,3	3,6	2,8	1,9	1,3	1,8	2,9	

TABLE 2. Sensory attributes for lambmeat (*M. longissimus dorsi*) from ewe, wether and ram at different ages.

Sensory attribute Scores (0-100)	Age at slaughter (days)												Pooled SD	Level of significance
	140		165		185		200		215		240			
	Ewe	Ram	Wether	Ram	Wether	Ram	Wether	Ram	Wether	Ram	Wether	Ram		
Odour of the fat	56	56	59	55	53	57	55	55	53	54	52	49	17,5	NS
Abnormal odour of fat	11	11	9	7	7	13	12	15	8	7	10	10	16,2	NS
Odour of the lean	57	57	58	58	56	57	55	52	54	56	56	56	13,4	NS
Abnormal odour of the lean	14 ^{ab}	8 ^a	7 ^a	8 ^a	11 ^{ab}	12 ^{ab}	10 ^{ab}	18 ^b	9 ^{ac}	11 ^{ab}	17 ^{bc}	12 ^{ab}	16,0	*
Juiciness	53	54	48	55	54	50	47	51	45	46	49	45	19,1	NS
Tenderness	80 ^a	71 ^c	73 ^c	59 ^{de}	69 ^c	54 ^d	59 ^{de}	53 ^d	53 ^d	42 ^b	63 ^c	56 ^{de}	20,9	***
Sheepmeat flavour	62 ^a	60 ^{ab}	58 ^{ab}	62 ^a	62 ^a	60 ^{ab}	55 ^b	57 ^{ab}	58 ^{ab}	56 ^{ab}	61 ^{ab}	59 ^{ab}	14,0	*
Livery	13 ^a	7 ^{bc}	7 ^{bc}	3 ^b	4 ^{bc}	4 ^{bc}	3 ^b	2 ^b	3 ^b	2 ^b	8 ^c	2 ^b	9,3	***
Rancid	1	3	1	1	1	1	1	2	1	1	1	1	3,3	NS
Fatty	3	3	3	3	3	3	4	5	4	4	5	4	7,4	NS
Abnormal flavour of the lean	10 ^b	16 ^{ac}	7 ^b	8 ^b	12 ^{bc}	11 ^b	14 ^{bc}	18 ^{ac}	11 ^{bc}	14 ^{bc}	22 ^a	11 ^{bc}	18,7	***

Values in the same row with different letters are significantly different within attribute, $p \leq 0,05^*$, $p \leq 0,01^{**}$, $p \leq 0,001^{***}$.

NS = Not significant.