THE EFFECT OF DEPELTING WITH AIR INFLATION ON THE APPEARANCE AND MICROBIOLOGY OF LAMB CARCASSES

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INTRODUCTION

Air inflation is currently used in Italy for depelting lambs under 15 kg live weight. Meat producers claim that after inflating air into the subcutaneous tissue hand depelting is easier, the lamb carcasses have a better appearance and there is a lower incidence of cuts to the subcutaneous fat or muscles (Severini et al., 1994). However, the prevention of physical and microbiological hazards should be secured. Consequently, studies are needed to better define how compressed air may be hygienically produced (Guyader and Masquelier, 1995) and how it may be used for depelting lambs.

OBJECTIVE

The aim of this paper is to investigate the effect of air inflation on the appearance and the hygienic characteristics of light lamb carcasses.

MATERIALS AND METHODS

Eighteen Appenninica breed lambs of about 70 days of age weighing 14-15 kg were used in this study. The fleece of the animals showed a good degree of cleanliness before slaughter. The lambs, were devided into two groups, slaughtered in a medium-size industrial EC abattoir and depelted with or without the use of air inflation. All lambs were processed in the same way: electrical stunning, vertical bleeding, removal of the fore feet, opening cuts made over the hind-legs. Afterwhich, the lower part of the hind-legs were removed and the animals hung by the hind-legs on a rail. The pelting procedure was manual: the fleece was inverted and pulled down from the back to the head without making any other opening cuts. However, in one group (group A) after removal of the fore legs and before proceeding with the other steps, a nozzle connected with an insulated air pressure system (9 bar) was inserted under the skin on the right foreleg and compressed air was blown into the subcutis, thus disconnecting the skin from the carcass. In the other group (group B) this step was omitted.

Visual examination of carcasses

The appearance of the lamb carcasses was evaluated at the end of dressing and at 24 hours post mortem (pm). General characteristics, shape, cleanliness and presence of abnormalities of the exposed tissues, i.e. ruptures or presence of air in the tissues, and incidence of cuts to the subcutaneous fat and muscles were evaluated.

Instrumental measurements

Surface colour was measured (CIELAB, 1976 system) with a Minolta CR-200 (C illuminant, white calibrating plate: L*97.91; a*-0.43; b*2.31) at the end of dressing and after 24 h chilling. Measurements (mean of three replicates) were taken at the external part of hind legs, shoulders, rack and breast (exposed pectoral muscles). The pH 24 h pm was measured with a combined glass probe electrode placed directly into the *Longissimus dorsi* and *Biceps femoris* muscles.

Microbiological analysis

Four swab samples were taken immediately after depelting from a 10 x 10 cm area at both shoulders and the dorsal part of hind-legs from 6 carcasses in each group. The swabs were transferred into sterile vials containing 10 ml of sterile 1% peptone in phosphate buffer solution, mixed thoroughly and analysed within 2 hours. Triplicate samples from each swab and two serial dilutions were spread onto predried plates and analysed for CMT on plate count agar (Difco) at 30°C for 72 h, total coliform bacteria on MacConkey agar n 3 (Difco) at 37°C for 24 h and Staphylococcus spp. on Baird-Parker agar (Difco) at 37°C for 48-72 h.

RESULTS AND DISCUSSION

All carcasses showed medium fatness, with shoulders and hind legs rather extensively covered by fat, while the hind half/third part of the rack was exposed. They showed a good degree of cleanliness which could be attributed to the cleanliness of the lamb fleece and the fact that the fleece was not cut at the level of the abdomen and breast.

The carcasses depelted with air inflation (group A) were well-shaped, rounded and had a smooth surface without visible signs of cuts. In all carcasses in this group infiltration of air into the subcutaneous tissue was detected in various areas, especially within the fat covering the shoulders and under the peritoneal layer covering the *Rectum abdominis* muscle. In two of nine cases slight disconnections were detected in the pectoral muscles. The same findings were found after 24 h chilling, but the tissues were obviously drier and firmer. The carcasses depelted without the use of air inflation (group B) were not as well-shaped as group A and the surface was less smooth, due to signs of stretching in the subcutis of the shoulders and flanks. Instrumental measurements of colour (L* values) are reported in Table 1. The carcasses depelted with the use of air inflation showed higher L* values at shoulders and hind-legs. The pH 24 h values were similar in the two groups in the Ld muscles (group A = 5.75 ± 0.20; group B = 5.78 ± 0.21) and showed only slight differences in the Bf muscles (group A = 5.85 ± 0.22; group B = 5.69 ± 0.31). As no DFD cases were detected in either group and the animals had similar characteristics (breed, age, feed regimen, fatness) the difference in the L* values may be related to the different depelting processes. Other parameters of colour (a* and b* values) did not show relevant differences.

Table 1 - Colour (L* values) of lamb carcasses depelted with (group A) or without (group B) use of air inflation (group B) (mean ± *sd*)

	at the end of dressing				after chilling (24 h pm)			
	group A		*group B*		*group A*		*group B*	
Shoulder	74.78	*± 3.01*	60.48	*± 6.88*	61.64	*± 9.67*	56.75	*± 8.83*
Hind-leg	65.64	*± 6.17*	59.59	*± 2.79*	62.97	*± 5.05*	52.59	*± 5.76*
Rack	65.50	*± 1.36*	63.21	*± 2.73*	63.08	*± 4.51*	63.06	*± 3.21*
Pectoral muscles	55.90	*± 6.32*	56.72	*± 4.93*	51.33	*± 6.36*	50.13	*± 4.46*

Mean values of total mesophilic count, coliform organisms and *Staphylococcus spp.* from all sampling sites, shoulders and hind legs of carcasses depelted with and without air inflation are shown in Table 2.

Table 2 - Microbial contamination of carcasses derived from lambs depelted with or without air inflation

		group A			*group B*		
		TMC	colif.	Staph. spp.	TMC	colif.	Staph. spp.
All sampling sites	x	2.72	0.21	1.62	2.20	0.06	1.49
	s	0.86	0.36	0.59	1.12	0.19	0.75
	Log A	3.30	0.31	1.91	3.08	0.00	2.04
Shoulders, all	x	2.59	0.11	1.73	2.17	0.04	1.51
	s	0.85	0.22	0.60	1.11	0.14	0.69
	Log A	3.12	0.00	1.98	2.94	0.00	1.93
Hind-legs, all	x	2.84	0.30	1.52	2.23	0.09	1.48
	s	0.88	0.45	0.58	1.18	0.23	0.83
	Log A	3.43	0.49	1.82	3.19	0.00	2.13

TMC = total mesophilic count; x = mean of logs; s = standard deviation of logs; A = arithmetic mean

Mean levels of total mesophilic count (Log_{10} CFU /cm^2) of the carcasses depelted without air inflation ranged from 1.65 to 3.54, whilst those of the carcasses depelted with air inflation ranged from 1.97 to 3.55. Coliform organisms were detected only in two out of six carcasses depelted without air inflation, but they were detected in all carcasses depelted with air inflation and ranged from 0.06 to 0.71. *Staphylococcus spp.* counts of the carcasses depelted without air inflation ranged from 0.87 to 2.40, whilst in the carcasses depelted with air inflation they ranged from 1.14 to 2.20.

The mean level of contamination for all carcasses, whether depelted with and without air inflation, was 2.46 (1.65 - 3.55) for total mesophilic aerobes, 0.14 (0.00 - 0.71) for coliform organisms and 1.56 (0.87 - 2.40) for *Staphylococcus spp.* Presumed *Staphylococcus aureus* (colonies with light halo on Baird-Parker agar) were detected at times and mostly from carcasses derived from lambs depelted without air inflation. To sum up, the two methods of depelting produced carcasses with similar counts, coliform organisms and *Staphylococcus spp.* values. The mean microbial loads observed in this experiment are within the range of what has been reported as acceptable for lamb carcasses (Prieto et al., 1991; Ellerbroek et al., 1993; Biss & Hathaway, 1995; Colavita et al., 1995).

CONCLUSIONS

Hand depelting with air inflation resulted in carcasses having a better appearance in terms of shape and L* value, and a surface microbial load similar to carcasses depelted without air inflation. However, the slight infiltration of air in the subcutaneous tissues should be taken into due consideration. Indeed, further studies need to be carried out to improve controls in production and the use of compressed air. Moreover, any correlated microbial risk should also be thoroughly investigated.

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