IS MOBILE ABATTOIR BENEFICIAL FOR MEAT QUALITY?

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I. INTRODUCTION

Handling at slaughter inevitably exposes production animals to welfare risks and can be the most stressful event in their lives. [1] and [2] found a connection between rough handling and behavioral stress reactions in the animals. Although efforts have been made to reduce animal suffering in transport and slaughter, most farm animals still experience significant stress just before and during slaughter. Strong or prolonged stress leads to reduced animal welfare. In addition to reducing animal welfare, stress associated with slaughter may impair meat quality, causing financial losses. As studies have shown that animal welfare in commercial slaughter varies considerably, there is reason to believe that differences in several respects exist between stationary and mobile slaughter.

There is growing interest in small-scale mobile abattoirs, which might have the potential to reduce the stress that the animals experience by shortening or completely eliminating the transport to the plant, and by reducing exposure to unfamiliar environments, animals and persons. The effects of mobile slaughter on animal welfare and meat quality have so far not been studied to a large extent. During 2013-2014, a Swedish company developed a mobile slaughterhouse for commercial slaughter of large cattle in Sweden. The objective of this project was to compare animal welfare and meat quality at mobile vs. large scale stationary slaughter.

II. MATERIAL AND METHODS

One mobile and one stationary abattoir were studied. At the mobile plant, the animals were taken from the farm facilities to an inspection pen, from which the animals were driven along a short driveway to the stun box. Animals slaughtered at the stationary abattoir were transported up to 250 km, and about one third of them were kept in overnight lairage before slaughter. A total of 283 vs. 281 mix of animals of dairy, beef breeds and crosses thereof, with an aver all average carcass weight of 341 kg, were included and slaughtered at the mobile and the stationery plant, respectively. At the stationary plant, the carcasses were electrically stimulated. At both plants, 7 days of hanging were applied from slaughter to cutting. The mobile plant used pelvic suspension and the stationary plant achilles suspension. The observations included animal handling and animal behavior in the driveway to the stun box and in the stun box, blood chemistry at bleeding (lactate, glucose, cortisol), veterinary inspection findings, carcass conformation and fat grading (EUROP scale), marbling score (LD:10^{th} to 11^{th} rib) and meat quality attributes (pH, color, Warner Bratzler Shear Force, compressive load and modulus, weight loss at thawing and cooking) after 7 days of hanging in the LD.

III. RESULTS AND DISCUSSION

On average, the total number of stress behaviors in the driveway and stun box was slightly higher at the stationary plant. Regarding stress indicators, blood cortisol levels were somewhat higher (NS) and lactate levels were lower ($p<0.5$) at the stationary plant while there were no differences between slaughter plants when it comes to glucose levels.

There was no clear association between final pH of the meat and the animals' emotional expression at the start of driving or with the way to drive the animals. Ultimate meat pH differed between the slaughter plants; carcasses slaughtered at the mobile plant had a higher pH, which could be due to the fact that carcass electrical stimulation was not used. The percentage of animals with a final pH above 5.8 at cutting was 14.8% at the mobile plant and 7.7% at the stationary one. At both plants, cooking loss decreased with increasing fat class and with increasing marbling. There was a tendency to a reduced cooking loss after longer transport distances in animals not staying at the stationary plant, as well as on average in animals that stayed overnight

compared to those that did not. Bulls had a slightly lighter and cows a slightly darker meat than other slaughter animal categories. The redness and yellowness of the meat were relatively similar in different slaughter animal categories.

Shear force and compressive load were higher at the stationary plant, where compressive load was highest in cows and bulls, which could be explain by the different hanging methods used at the two plants; otherwise the differences between different slaughter animal categories were small. At the mobile plant, animals regarded as hesitant prior to being driven had higher, and animals considered as nervous even higher, compressive loads. The same pattern was not seen for shear force. There was no clear association between meat texture and the transport distance to the stationary plant, but shear force and compressive load were slightly higher in animals staying overnight at the stationary plant.

Shear force and compressive load were weakly but significantly correlated with each other (Spearman rho=0.20; p<0.0001). Thawing and cooking losses were slightly correlated with each other (rho=0.23; p<0.0001) and with shear force (rho=0.22 and 0.19, respectively; p≤0.0002), but not with compressive load.

Table 1. Meat and carcass quality attributes

	Abattoir type		
Attribute	Mobile	Stationary	p-value
	n=283	n=281	
Technological meat quality			
pH-7 days pm	5,53	5,46	0.0003***
pH after thawing	5,64	5.67	NS (p=0,42)
Lightness, L*, 7 days pm	33,9	33,6	NS (p=0,31)
Redness, a*, 7 days pm	19,7	19,4	NS (p=0,77)
Yellowness, b*, 7 days pm	9,2	9,0	NS (p=0,38)
Thawing loss, %	4,5	5,2	0,048*
Cooking loss, %	23,2	23,0	NS (p=0.68)
Texture			
Shear force, N/cm^2	36,6	46,0	<0,0001***
Compressive modulus,,kPa	662,8	814,8	0,0010***
Compressive, load, kPa	15,5	25,1	0,0058**
Carcass quality			
Conformation (EUROP, 1-15)	7,6	5,9	<0,0001***
Fatness (EUROP, 1-15)	8,3	8,0	NS (p=0,18)
Marbling (1-5)	2,3	1,7	<0,0001***

IV. CONCLUSION

This project shows that calm animals when driving to the stun box begins, an appropriate layout of the slaughterhouse premises, driveways and equipment and correct handling of the animals during driving, stunning and bleeding are essential to achieve low stress levels and a high meat quality. There are conditions for good animal welfare and meat quality in both mobile and stationary slaughter of cattle. Based on the project, it cannot be concluded that animal welfare or meat quality is generally better with one or another way of slaughtering.

REFERENCES

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