

Blood aspiration during slaughter with and without stunning in cattle

NG Gregory

Royal Veterinary College, Hawkshead Lane, Hatfield, AL9 7TA, UK.

Abstract

The upper respiratory tract was examined in cattle for blood aspiration following shechita and following captive bolt stunning plus sticking. In both slaughter methods the cattle were held in the upright (standing) position during bleeding. Nineteen % of the shechita cattle and 21 % of the cattle that were stunned and then stuck had blood lining the inner aspect of the trachea. Thirty six and 31 % had blood in the upper bronchi, respectively. It was concluded that blood aspiration occurs during slaughter, and so concerns about airway irritation from fluid aspiration could be a concern in those animals that are not stunned or do not lose consciousness rapidly.

Introduction

Some authorities claim that aspiration of blood into the upper respiratory tract and lungs causes suffering during slaughter without stunning (von Wenzlawowicz and von Holleben 2007; Webster 1994). Others take the view that there will be no suffering because afferent signals activated by lung irritants are conveyed by neurones in the vagus nerves (King 1999), and these are severed during slaughter.

More recently, it has been shown in laboratory animal species that there is a collateral spinal afferent pathway between the lower respiratory tract and the brain, which passes through the cervicothoracic ganglia and dorsal root ganglia at T₂₋₄ (Qin *et al* 2007a). This pathway can relay signals that are sensed in humans as tickling, tearing or burning sensations provoked by chemical and physical stimuli in the lungs (Hummel *et al* 1997). If the same spinal pathway exists in ruminants and if blood enters the respiratory tract during slaughter, then blood aspiration could be a welfare concern during slaughter without stunning. The aim in this study was to determine the prevalence of blood aspiration in the lungs of cattle during slaughter without stunning by shechita. Following shechita the lungs are normally inflated during the bedika procedure. This allows examination of the pleura for imperfections. This study examined the frequency of blood aspiration in lungs that had been inflated as well as not inflated, and it compared the findings with corresponding treatments in cattle stunned by captive bolt and then bled.

Materials and methods

A total of 229 cattle (range in carcass weight 160 to 510 kg) were slaughtered at a UK abattoir. One hundred and twenty three animals were slaughtered by shechita in the upright position without stunning. The cut was made upwards and across the ventral aspect of the neck. One hundred and three animals were restrained in the same restraining pen used for shechita and stunned with a captive bolt gun (Matador, Termet Solefi, France) before sticking by the gash method (Gregory 1998).

Seventy nine of the 123 shechita-slaughtered cattle were subjected to lung inspection by the conventional bedika method. After evisceration, an inspector (bodek) clamped the severed end of the trachea to a nozzle that delivered compressed air to the lungs. The inflated lungs were examined by the bodek for adhesions and holes in the pleura.

Following bedika, and before the lungs were inspected by a Meat Hygiene Service inspector, the lungs were examined by the scientist for the presence of blood lining the inner wall of the trachea and major bronchi. A knife was used to open the trachea and bronchi and the presence of bright red bloody foam was noted if present. The amount of blood lining the inner surface of each trachea was scored as follows:- 0 none; 1 less than 10 % of the inner surface area of the trachea; 2 blood covered 11 to 50 % of the surface area; 3 blood covered more than 50 % of the surface area.

Forty four sets of lungs from the shechita-slaughtered cattle (36 %) were not inflated post-mortem either because the bodek could not keep up with the slaughter-rate or because the carcasses were unsuitable for the kosher market. Thirty two sets of lungs from the stunned cattle (61 %) were inflated using a simulated bedika procedure, and 39 % were not inflated. The tracheas and bronchi from the stunned and bled cattle were scored for blood in the upper respiratory tract using the same method.

The tracheas from three cattle, stunned by captive bolt and stuck, were infused with 40 ml heparinised blood. The lungs were rotated to encourage blood distribution to the alveoli. The lungs were then inflated and the trachea and bronchi scored for blood using the same method as above.

Results

There was no difference in the prevalence of blood (score 2 + 3) lining the trachea between lungs that were inflated after removal from the carcass and those that were not inflated (20 % of the animals in each case). Similarly, there was no difference in the proportion of inflated sets of lungs that had blood in the bronchi compared to non-inflated lungs (36 versus 30 %, respectively). On account of this lack of difference, and for clarity of presentation, the results for the inflated and non-inflated lungs have been pooled for comparing shechita with secular slaughter (Table 1).

Table 1. Frequency of blood in the tracheas and bronchi of cattle slaughtered by shechita and by captive bolt stunning followed by sticking

	Shechita	Secular slaughter
Number of cattle	123	103
Blood in trachea (% of animals)		
0 + 1	81	79
2 + 3	19	21
Bright red foam	10	0
Blood in bronchi (% of animals)	36	31

Nineteen % of 123 cattle slaughtered by shechita had substantial amounts of blood in the trachea (covering >10% of the inner surface area), and 36% had blood in the bronchi (Table 1). These prevalences were similar to those for the 103 cattle shot by captive bolt and gash stuck whilst in the same upright position (21 and 31%, respectively). Ten % of the shechita cattle had a bright red bloody foam in the trachea, whereas none of the secular cattle had a bloody foam lining the trachea.

Nine tracheas were heavily contaminated with blood (score 3), 8 of which were from cattle slaughtered by shechita. In 6 of those 8 shechita cattle the blood lining the trachea was present as a fine bloody foam. In total there were 12 tracheas that had this fine red foam, and all were from shechita slaughtered cattle.

When heparinised blood was infused via the trachea, and the lungs inflated by a simulated bedika procedure, all tracheas had a blood contamination score of 3, but none had the fine red foam seen in the 12 shechita slaughtered cattle.

None of the cattle stunned by captive bolt showed breathing movements after they were shot. No lungs that were either abscessed or incised during evisceration were used in this study.

Discussion

This study showed that blood enters the trachea in substantial amounts in about 20 % of the animals that are bled whilst restrained in the upright position. Aspiration occurred in animals that had been shot and stopped breathing, as well as those that were slaughtered without stunning and continued to breathe after the start of bleeding. In other words, blood entered the trachea and bronchi irrespective of whether or not the animals were breathing once the trachea had been severed.

Fluid aspiration in conscious animals leads to irritation of sensory receptors lining the airway. In animals that have intact vagus nerves this provokes a cough reflex, but coughing would be absent when the vagi have been severed (Canning 2007). In a study of 347 cattle undergoing shechita and halal slaughter without stunning (Gregory *et al.* 2008), over 90 % had both vagi completely severed. So, a cough reflex would not be expected in the majority of animals in this situation even though airway irritation may occur through sympathetic-spinal afferent pathways (Qin *et al.* 2007a). Severing the vagi can modulate signals conveyed by the spinal afferent pathway (Qin *et al.* 2007b). The modulation can be either excitatory or inhibitory depending on the individual spinal neurones and their site of origin within the lung.

The presence of a fine bloody foam lining the trachea could indicate the aspired blood had been agitated and broken up during breathing movements before clotting occurred. If this is an accurate interpretation, the findings indicate that repetitive breathing on aspired blood occurred in 10 % of the shechita slaughtered cattle. In a limited number of lungs it was found that introducing heparinised blood via the trachea and inflating the lungs once, as in the bedika procedure, did not result in a fine bloody foam presenting itself on the inner surface of the trachea. Instead, the blood was present as a fluid film, with some large dark red bubbles.

Conclusion

It is concluded that the concerns about blood aspiration are warranted for a proportion of cattle slaughtered by shechita in the upright position.

References

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