The Bleeding of Slaughtered Lambs for the Purposes of Halal Slaughter

by Rizvan Khalid

September 2011

University of Bristol - Division of Farm Animal Science
Langford
Bristol
BS40 5DU
UK

A dissertation submitted to the University of Bristol (UK) in accordance with the requirements of the degree of MSc Meat Science and Technology in the Faculty of Medical and Veterinary Sciences.

1 www.halal-autorite.com
A recent research reviewed the effect on bleeding of different lambs slaughter practices.

The dissertation was submitted by Rizvan Khalid for his MSc in Meat Science and Technology from the University of Bristol in September 2011.

The question raised has been in relation to bleeding, and whether or not it is compromised by any form of stunning. This kind of research is needed to understand what are the real effects of stunned animals. A research on poultry, cattle must be realized due to the fact that you cannot apply the results to all species.

The report is divided into sections:

1. **Exsanguination of lamb** (the process by which blood is released from the animal)
2. **Factors affecting blood lost**
3. **Islamic scripture** in relation to blood and common conceptions about bleeding and residual blood

The research did not analyze the effect of the stun on animal (alive or not) but the effect on the bleeding.
In the introduction the scientist notes the importance of bleeding for health, for the Muslim faith and the obligation to eat halal for a Muslim.

He defines two criteria for halal:
- Animal must be alive before slaughter
- Blood must not be consumed

About the permissibility of stunning he quotes the fatwa of Taqi Usmani (2004, p83) “If it is shown conclusively that this is indeed the case [i.e. that stunning reduces pain to the animals], and that the animal does not die from being stunned, then it is permissible to use these methods. Otherwise it is not.”

After defining the importance and the method of exsanguination (generally a transverse neck cut), the author explains that death is a process. After an effective neck cut sheep become unconscious within 5-7s (Farm Animal Welfare Council’s, 2003) and do not feel pain.

The distribution of blood in a slaughtered lamb is difficult to measure, some of the blood is lost during exsanguination 50% Kirton 1981, some during dressing (10-15% Warris) and some is left in the meat (1-4% Warris / Rhodes 1977), they call it the residual meat.

**Factors affecting blood Lost at Exsanguination and Residual Blood**

The author shows the main factors which affect bleeding:
- The size of the wound
- Position of the carcass
- Time and dressing procedures

Scientists like Warris (1984) have analyzed the first-120s blood lost and stated that it is likely that when an animal is exsanguinated, the blood which is lost comes from vessels larger than approximately 0.3-0.6mm in diameter.

Hopkins et al (2006) demonstrate that electrical stimulation can improve the bleeding but it is unclear whether the blood have been retained or released during carcass dressing.

Anil et al (2004) conducted an experiment on 60 sheep (22-68kg) in Turkey to compare bleeding using different methods of Halal slaughter.
They found an adjusted average of blood:

1.58kg for 30 NS sheep (av. LW 38.6kg),
1.62kg for 18 EHOS sheep (350V for 3s, av. LW 45.6kg)
1.53kg for 12 Penetrative Captive Bolt Stunning (PCBS) sheep (av. LW 37.5kg).

It was concluded that there was no (statistically) significant difference between treatments after 90s of bleeding (blood weighing approx 4% of LW).

*Velarde et al* (2003) slaughtered sheep
21 NS (av. LW 20.3 + 0.45kg)
22 EHOS (av. LW 19.5 +0.43kg, 250V constant volts, 50Hz sinusoidal AC, 3s, dry scissor tongs)
They found blood loss relative to LW (BL %)and Killing-Out % (KO%) to be significantly higher (P<0.05) in EHOS lambs.

*Kirton et al* (1981) compared bleeding and blood splash in lambs slaughtered
NSGC (av. LW 31.4kg),
EHOS (av. LW 31.3kg, 0.75A, 50Hz, 1.4s) and Electric Head-to-Back Stunning (EHBS) (av. LW 31.3kg)
There found no difference between NSGC and EHOS but the EHBS treatment group released significantly less blood (P<0.001).

*Warriss & Leach* (1978) slaughtered 80 lambs (30-40kg) in 8 balanced groups permutating through different protocols.
They also found significantly more (P<0.05) blood lost during EHOS (1,335g) than CBS (1,223g).

*Blackmore & Newhook* (1976) compared different slaughter methods (NSGC, CBS, EHOS) using a permutation of different animals (ewes and lambs). They found that NSGC ewes bled more than CBS ewes.

Residual blood in meat

*Warris* (1978) suggested that the main factor determining the residual blood content of meat was the *degree of physiological stress* experienced during slaughter and concluded that there is no evidence that the amount of residual blood is affected by different slaughter methods.

*Warris* (1984) stated that there is no evidence that the amount of residual blood is affected by different slaughter methods.
Chrystall et al (1981) showed that there was no difference in the residual blood content of lamb, the microbiological status of the meat and its tenderness using different slaughter methods.

**Residual blood in major organs**

Hansard (1956)’s study show that spleen and lungs contained the most blood with a blow to the head slaughter.

**Blood splash and Specking**

Blood splash usually occurs following electrical stunning and is rarely found in NS lambs. And is negligible in PCEHOS. Kirton et al (1978) suggested that current resulted in damage to small blood vessels, damaging surrounding issues.

**Islamic-Scripture in Relation to Blood as Food**

Several verses in the coran shows that blood is forbidden the author ask which kind of blood is it ?

Is it the blood lost at exsanguination or the blood that comes free from meat ?

The explanation is in the commentary of Ibn Kathir (d1373), the bood lost at the exsanguination is the one which is forbidden, residual blood is permitted.

The second aspect is how much blood is permitted in the meat ?

The liver and the spleen are halal and are the most important organs containing blood, he quotes in Tafsir Ibn Kathir the hadith mentioned by Ahmad (d855) and ibn Majah (d887). No research has been done yet on the amount of residual blood between the different slaughter methods.

As far as the spinal cord cutting is concerned Khan (1984) argues that it is unacceptable because carcass convulsions are required to 'squeeze all blood of the meat'.
Conceptions about Bleeding and Residual Blood

The author quotes the statement of Khan (1983, p7): "It is therefore essential that the method employed in killing an animal for food should ensure the maximum extraction of blood from the meat."

This statement shows that exsanguination must be as much as possible but do not specify the minimum amount of blood acceptable. The Islamic method is the best for blood extraction.

Residual blood, NS meat better than sunned meat

Scientist like Velarde et al (2003) found that there was no difference overall between both methods.

Effects of stunning method on bleeding

The author analyzes different stunning affect on bleeding like:
- Blood splash,
- Flow reduction at exsanguination,
- Affect on ph

The author quotes Kan but notes that the statement is true only for EHOS of sheep: "Concerning stunning and its effects on bleeding, it is a fact that all methods of stunning produce neurogenic shock, a condition in which blood leaves the circulation. In this condition, the nerves which regulate the size of the blood vessels are paralyzed. Blood fluid then leaves the circulation and enters the inter-cellular spaces in the tissues. When such an animal is bled, this fluid is not available for expulsion into the circulation and finally out through the wound". (Khan, 1982, p18).

The author thinks that there is little evidence that kicking after slaughter influences blood lost, and he suggests that further research must be done. There are no evidence as well that the method of slaughter influences ph, however Linares et al (2007) did find significantly lower (P<0.001) pH7days post-mortem in NS compared to EHOS and GSL.

A beating heart is required for maximum bleeding. If cardiac arrest occurs there is stagnation of blood in the carcass resulting in greater residual blood. Electrical stunning can affect the beating of the heart.
The author in this party try to analyze if a beating heart affects maximum bleeding. Scientists like Khan (1983) analyzed that a beating heart is important,

Warris (1984) stated that a beating heart is unlikely to directly affect the drainage of blood from the carcass. Further research is needed to establish the heart’s function.

EHBS is designed to stun and induce a cardiac arrest, EHOS does not produce a cardiac arrest as it targets the brain only depending on frequency.

Carcass convulsions are required to maximize bleeding, cutting the spinal cord could have an effect on residual blood.

Chrystall et al showed that I did not result in less residual blood.

Blood consumption and health

The author has not come across any evidence that there is an interaction between residual blood and food disease.

Warris (1984) states “There is no evidence that this amount (the residual blood content of meat) is affected by different slaughter methods or that large amount of residual blood influence the microbiology of meat”.

Blood and meat quality

Several parameters affect meat quality, scientists did not find difference between different methods of slaughter. More research on meat quality parameters following halal slaughter using non stunned and stunned methods.
CONCLUSIONS

This paper reviews existing literature in relation to the bleeding.

We must take care to findings because of different methods of slaughter and different species.

It is recommended that future research priorities for Halal slaughter of sheep should include the following:

- Develop best practice Halal slaughter protocols for each of the methods (NS, EHOS, PCEHOS) in accordance with PATK (2009).

- Investigate the time, following a ventral neck cut, at which venous pressure to the heart is lost thereby disabling its function as a pump.

- Assess experimentally the residual blood content of lean meat and major organs following different slaughter methods i.e. NS, EHOS and PCEHOS.

- Compare the effect of carcass convulsions on residual blood following the different slaughter methods (NS, EHOS and PCEHOS) including a step which severs the spinal cord (or not) for each treatment.
References

Muhammad Taqi Usmani Mufti
Fatwa from Darul Ifta, Jamia Darul Uloom Karachi
Regarding stunning and other practices in the Halal meat industry
http://www.hizbululama.org.uk/highlights/1432ah/dhuilhajj/Fatwa_from_Darul_Uloom_Karachi.pdf


Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBS</td>
<td>Captive-bolt Stun</td>
</tr>
<tr>
<td>EHOS</td>
<td>Electric Head-Only Stun</td>
</tr>
<tr>
<td>EHBS</td>
<td>Electric Head-to-Back Stun</td>
</tr>
<tr>
<td>GS</td>
<td>Gas Stun</td>
</tr>
<tr>
<td>GM</td>
<td>Genetically Modified</td>
</tr>
<tr>
<td>KOP</td>
<td>Killing-Out Percentage</td>
</tr>
<tr>
<td>LW</td>
<td>Live-Weight</td>
</tr>
<tr>
<td>NCBS</td>
<td>Non-Penetrative Captive-bolt Stun</td>
</tr>
<tr>
<td>NS</td>
<td>Non-Stun</td>
</tr>
<tr>
<td>NSGC</td>
<td>Non-Stun Gash Cut (as traditionally practiced in New Zealand)</td>
</tr>
<tr>
<td>NSND</td>
<td>Non-Stun Neuromuscular Blocking Drug</td>
</tr>
<tr>
<td>PCBS</td>
<td>Penetrative Captive-bolt Stun</td>
</tr>
<tr>
<td>PCEHOS</td>
<td>Post-Cut Electric Head-only Stun</td>
</tr>
</tbody>
</table>