Bloodspotting and Inverted Dressing

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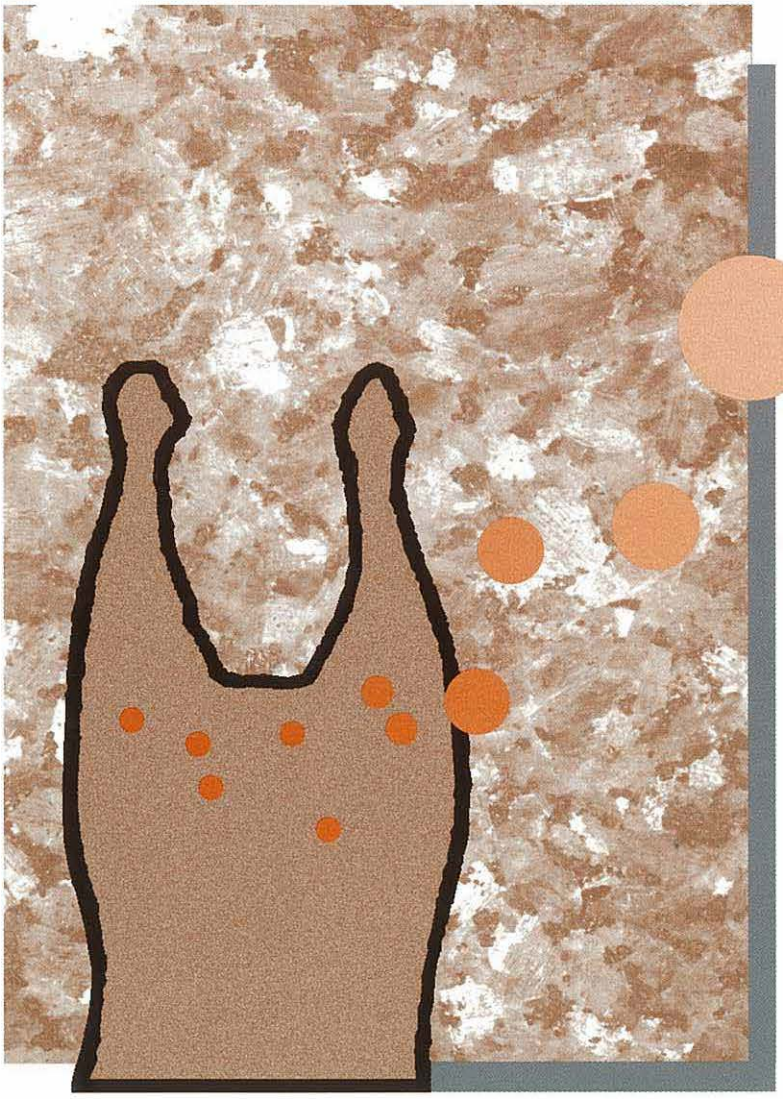


Meat Research Corporation

During dressing on inverted dressing lines, surface blood spots and streaks can occur on the hindquarters of ovine carcases and financially impact the industry. These two blemishes can be reduced, however, by two practices: efficient bleeding and use of adequate lead-up work before mechanical pulling of the pelt.

While reducing the incidence of blood spotting and streaking is possible, it is probably unrealistic to achieve complete avoidance.

Blood Spotting, Blood Streaking

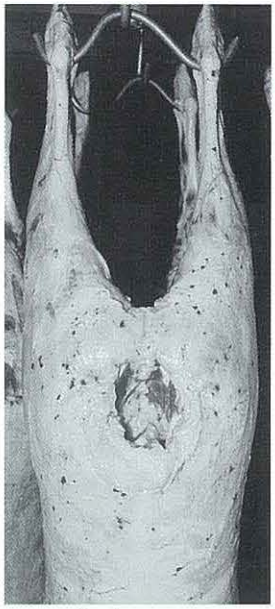
Blood spotting defects are most commonly seen in carcases from inverted dressing lines.

As the pelt is removed, pressure is imposed on the carcase surface by the caudal pulling action, i.e. pulling towards the hindquarter area. This appears to lead to engorgement of the surface blood vessels in the loin, chump and leg areas, followed by the rupture of some vessels as the pelt is separated from the carcase.

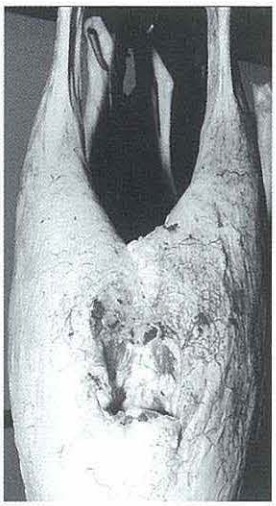
The surface blood spots which form are called petechial haemorrhages and can vary in diameter from 0.5 to 3.0 mm. These haemorrhages are quite different from ecchymosis, as they exist in and on the surface fat but not in the muscle.

Although blood spotting and blood streaking can occur simultaneously, blood streaking is an aggravated form of blood spotting. Observations in trials established to determine the causes of blood spotting and possible remedial actions indicate that spotting was the most frequent form of the defect when the selvage was left largely or completely intact throughout the dressing process.

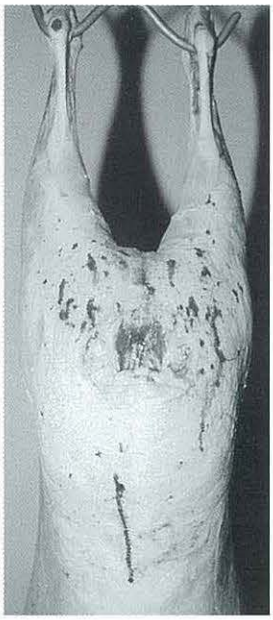
When the selvage is damaged to any significant extent during dressing, instead of some of the superficial blood vessels simply being ruptured beneath the selvage surface, the blood vessels are severed altogether. The open ends of the torn blood vessels are often at the carcase surface when the selvage has been partially stripped. Blood runs from these open ends down the exposed surface of the carcase and also within the loosened layers of the surface tissues. The result is unsightly runs, or "streaks".



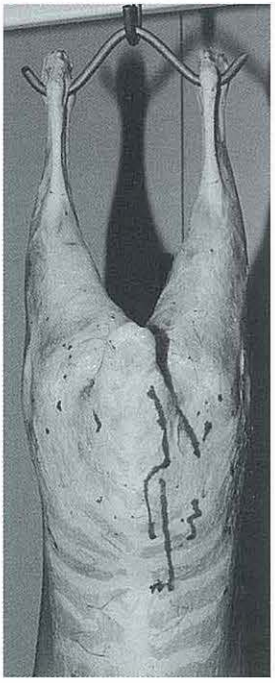
Minor blood spotting



Streaking and spotting



Superficial streaking and spotting



Streaking can often run well down towards the shoulder area of the carcase after it has been reverted to the conventional hanging position.

Defining the Problem

As the pelt is pulled from the carcase, a band of pressure bears on the tissues adjacent to the line of separation. In inverted dressing systems, as this pressure band moves over the loins and hindquarters of the carcase, it pushes blood through the veins near the carcase surface. It is believed that the pressure induced in these veins causes the valves to close, as the valves are there to restrict blood flow in the caudal direction. This pressure eventually ruptures some of these vessels, and blood invades the surrounding tissue or leaks through broken veins onto the surface of the carcase.

Pre-pelting work-up, the design of the system and the manning levels can all influence the pressure on the carcase surface.

Cost to the Industry

The cost of blood spotting and blood streaking to the sheep and lamb industry is difficult to quantify because of the variable end-uses of the product. The following situations shed light onto the impact of these defects:

- Heavy, well-finished lamb carcases weighing 18-22 kg and intended to be vacuum packed for shipping to North American markets have been occasionally badly affected with blood spotting and streaking. The haemorrhages gradually spread across the surface of the vacuum-packed lamb portions, leading to a most unsatisfactory appearance at out-turn, and an almost certain claim against the packer.

  The alternative is extensive trimming to remove the defect before the product is vacuum packed. This leads to yield losses and product with a much-reduced visual appeal. The trimming is also all-too-obvious on the final product. In fact, some clients are not prepared to accept product trimmed in this way. Clearly, there is a very real cost incurred as a result of these defects in this market situation.

- A similar situation applies to lamb carcases intended for domestic markets.

For example, it is known that major buyers have rejected whole chillers of lamb carcases as a result of observing several carcases showing severe cases of the haemorrhage defect.

- Even though these carcases can be sorted or graded to partly overcome a rejection, this inevitably costs at least the time and labour involved in the additional handling. If trimming is required, as is known to happen from time to time, these costs are simply increased.
- Because these haemorrhage defects are restricted to sheep carcases, the potential cost to the processor depends on the end uses of the carcases. If carcases are boned on-site for production of manufacturing meat, the cost penalty may be small. However, if the carcases are frozen for export, the badly affected carcases are culled, again involving additional labour costs and possibly trimming losses as well.

Trials

Investigations into blood spotting and streaking were started when Australian product at the Saudi Arabian port of Daman was rejected on the grounds of "improper bleeding" in 1993. The Saudi inspection service maintained that the blood spotting and streaking on the rejected product rendered it unfit for human consumption under Islamic law.

Upon investigation, the product was traced to a plant using an inverted dressing system.

New Zealand became aware of this haemorrhage problem in 1978, and, after some examination of the situation by MIRINZ, various trials were conducted. These trials identified the source as the use of restrainers and the new slaughter systems (i.e. inverted dressing). However, because of the relative ease with which pelts can be removed from New Zealand's so-called "sappy lambs", the problem does not appear to have led to commercial difficulties.

In June 1993, several New South Wales and Victorian plants which had suffered rejections were surveyed to determine three key issues:

1. the extent and severity of the haemorrhage defect;
2. whether any common factors existed; and
3. what further work might be appropriate to help reduce or eliminate this problem.

The survey identified seven significant points:

1. Plants varied widely in the extent and consistency of work-up before the pelt-puller.
2. Although the haemorrhage problem occurred with less frequency on young, good quality lamb carcases, the incidence and severity varied considerably between the plants visited.
3. The manual work-up before pelt-pulling varied considerably between carcases. This appeared to be related to chain speed and to the fact that manual work-up on sheep carcases is physically more demanding than for young lambs.
4. Conventional dressing (as opposed to inverted dressing) does not cause the haemorrhage defect.
5. In-plant attempts to change the angle of pelt-pulling to reduce this problem have been unsuccessful because the hindquarters of the carcase are usually free to swing. As a result, the resistance to pulling the pelt inevitably draws the carcase into the line of pull.
6. Unlike conventional dressing, inverted dressing frequently leaves a large patch of capillary-laden tissues over the chump and dorsal areas of the legs. After pelt-pulling, these blood vessels are usually engorged with blood (a "road-map-like" effect). It is these vessels which, if ruptured, give rise to the haemorrhage defect.
7. Pressure exerted along the pelt separation line during pelt-pulling caused the engorgement of blood vessels and the ruptures which lead to haemorrhages.

While slowing down the chain would reduce the pressure along the separation line during pelt-pulling, this answer would not be commercially acceptable. The alternative approach was to inject air between the pelt, the chump and dorsal areas of the legs to help free the pelt and to reduce the forces on the carcase surface at the separation line during pelt-pulling. After two series of trials, this method was also determined to be commercially unacceptable.

Despite injecting air beneath the pelt at a number of hindquarter sites (eg. either or both hind hocks, along the top of the tail and, using a suitably designed nozzle, simultaneously along the top of the tail and to either side of it), three insoluble problems cropped up:

1. The time to achieve adequate insertion of the nozzle under the skin was simply too long;
2. The air readily by-passed the "target areas" and quickly collected in the flanks and shoulder areas instead, apparently because the pelt is more tightly bound to the carcase in the "target areas"; and
3. The ready collection of the injected air in what are normally the looser areas of the carcase made pelt clearing and pulling in those areas more difficult.

Work reported in 1982 suggested that several soluble chloride salts in drinking water led to increases in carcase weight, easier pelt removal and stronger casings. A trial was therefore conducted with a small group of sheep from the same pastures to test whether addition of salts to drinking water would help in pelt removal.

Although no improvements in the ease of pelt removal, as indicated by a reduction in the amount or intensity of blood spotting or streaking were detected, management where the sheep were processed claimed that the quality of the "second cut" casings derived from the test group of animals showed a marked improvment.

Reducing Blood Spotting, Streaking

Efficient bleeding isn't the sole answer to eliminating blood spotting and blood streaking. Even with efficient bleeding, only about 40-60% of the blood is removed from the carcase.

Since the quantity of blood involved in blood spotting is only a very few millilitres at most, changes to bleeding performance will not have a substantial effect on blood spotting. On the other hand, the severity of blood spotting can be reduced by efficient bleeding.

To maximise efficient bleeding:

- The vena cava must be fully severed with a thoracic stick.
- As much time as possible should be allowed for bleeding prior to inverting the carcase.
- Carcases should be hung vertically for as long as possible before putting them on the spreaders. When on the spreaders, the carcase head and shoulders should be positioned below the back and the hind legs to provide as complete and rapid bleeding as possible and to minimise pooling of blood in the tissues near the surface of the back.
- The time during which the carcase is in the inverted position prior to pelting should be minimised.

The incidence and severity of blood spotting can be reduced – but not eliminated – by following slash cut sticking (whether this is done as ritual Halal or conventional slaughter) as rapidly as possible with a full thoracic stick. The thoracic stick should be deep and the vena cava should be severed close to the heart.

The severity of blood spotting is directly related to the quality and extent of pre-pelting work-up.

Accurate clearing and punching of the lateral surfaces of the chump and leg can reduce the problem. In particular, good clearing and positive separation of the pelt from the selvage lessens blood spotting. A good standard of pre-pelting work-up also improves carcase presentation.

Age of lambs and sheep is another factor impacting the incidence of blood spotting and streaking. While reducing blood spotting is possible when dressing good quality lambs, the same cannot be achieved when dressing older sheep, even when they are dressed with the same care.

Removing the pelts from "sappy" lambs is much easier than pelting older sheep. The strength of adhesion of the pelt to the outer fell appears to rise markedly with animal age, thereby requiring additional force to remove the pelt, and this appears to be closely related to the occurrence of blood spotting in older sheep.

Manning of the chain must be consistent with achieving good dressing. Before the carcase reaches the mechanical pelt-puller, sufficient time is required for manual work-up. If the work-up is incomplete, excessive pressure will be applied to the carcase surface when the pelt is pulled and blood spotting will occur. All the effort of skin removal must not be left to the mechanical pelt puller.

Transporting, animal handling, humidity and temperature also appear to affect blood spotting. It has been suggested that blood diverted to the skin (as in hot weather) leads to greater engorgement of the vascular system over the loin and chump areas during inverted dressing. When blood vessels are engorged, they can burst and cause blood spotting or streaking. In most situations, procedures can be developed and implemented to reduce blood spotting and streaking.

As a repair mechanism only, a large proportion of surface blood spotting can be removed with suitable mechanical carcase washing regimes. Streaks or runs within the surface tissues of a carcase can be removed to varying extents, depending on the size and depth of those streaks.

Wash jets should be angled about 45° below the horizontal. In 1994, trials conducted under the MRC Sheepline 2000 Blood Spotting Study included manual washing in an attempt to reduce the adverse effects of blood spotting. The results indicated that vertically oscillating jets should either supplement or replace fixed sprays in washing cabinets, particularly for washing the chump/leg area. Some jets also need to be angled so the water is applied to the lateral surfaces of the legs and chump. Achieving this, however, still requires intensive washing with water under considerable pressure.

Processors are encouraged to apply these preventive measures in preference to attempting to fix the problem after the event.

Further Information

Only a limited amount of information is available on this topic, and all of those sources have been used in compiling this report. Other sources include:

"Blood Spotting/Blood Streaking in Ovine Carcases". DR Smith, CSIRO Meat Research Laboratory, and G Rogers, AMLC Technical Services. June 1993.

"Trials on Air-Assisted Pelting of Ovine Carcases". DR Smith, CSIRO Meat Research Laboratory, and G Rogers, AMLC Technical Services. 30/7/93.

"Trials on Air-Assisted Pelting of Ovine Carcases". DR Smith, CSIRO Meat Research Laboratory, and G Rogers, AMLC Technical Services. 27/9/93.

"Blood Spotting Study" MRC Sheepline 2000. Project Number AMLC.014. G Rogers, AMLC, Industry Projects & Services Group, and DR Smith, Australian Meat Technology Pty Ltd. December, 1994.

Meat Technology Update No. 95/5, October 1995. Australian Meat Technology Pty Ltd.

The first four publications are available from Australian Meat and Livestock Corporation, GPO Box 4129, Sydney, NSW 2001. Telephone (02) 9260 3111, Fax (02) 9267 6620.
The Meat Technology Update No. 95/5 can be obtained by contacting Australian Meat Technology, Ms Madonna Scrase, Telephone (07) 3216 6222, Fax (07) 3216 7948

The final report of the Sheepline 2000 Blood Spotting Study (Project AMLC.014) can be obtained by contacting the MRC: Meat Processing Team:

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