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Blood Splashing in Bovine Meat Cuts

During the deboning procedure of Beef carcasses, it is often encountered that certain muscle cuts show clear signs of ecchymosis, also referred to as “blood splashing” or “blood spotting”.

This phenomenon occurs in seemingly healthy animals and is often not associated with any other signs of clinical disease or other abnormalities in slaughter stock. The financial impact due to losses incurred by this condition may however have a significant effect on the profitability of any meat producing/trading enterprise as huge losses can be linked to this condition due to product downgrade or condemnation.

Blood splashing is considered an aesthetic condition and under the red meat regulations promulgated under the Meat Safety Act (40 of 2000), such conditions generally regarded as aesthetically objectionable to the product consumer must be condemned.

So how does this happen? A single true cause for blood splashing has never been determined yet. It is however well-known that a multitude of variable and coinciding factors are usually associated with an increase in occurrence (‘multi-factorial cause’).

Blood splashing has been linked to a combination of increased blood pressure coinciding with weakened capillary vessel integrity. It is described in certain text books as an iatrogenic condition, in other words “man-made”, and is closely related to the time, method and means of stunning and bleeding as applied during slaughter.

Ecchymosis is an associated with the escape of red blood cells from capillary blood vessels into the surrounding muscle tissue. The haemorrhage may result from rupture of these blood vessels either through a sudden sharp increase in intraluminal blood pressure or due to rupture of a weakened section in the wall of the blood vessels (or combination of both). In fresh meat the haemorrhages appear as dark red spots, usually not more than 1 cm in diameter.

The effect of this on consumer food safety remains limited to the well-known phenomenon that meat containing free blood is liable to a shorter shelf-life than a similar well bled-out product, due to the fact that free blood acts as a pH buffer, thereby eliminating the natural formation of lactic acid post slaughter which is needed for the normal shelf-life stability of meat at a pH level of below at least 6.3

Aesthetically it is also true that a cooked meat cut containing ecchymosis will most probably be rejected by the consumer as the ecchymosis lesions will visually display as dark spots in the meat (sometimes a granular dark substance (cooked blood) is present in the lesion).

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Above: two feedlot A-Grade Cattle *M. longissimus dorsi* ('Striploin') cuts. The top cut (arrow) shows clear signs of blood splashing if compared to an unaffected cut (bottom).

How can we avoid this? Pre-slaughter excitement and other stresses can lead to a general increase in blood pressure in the larger blood vessels with an increase in the amount of blood in the smaller vessels due to an increase in the heart rate at the time of stunning. The vital importance of calm handling practices here cannot be over-emphasized. It is a proven fact that optimal animal welfare procedures before and at the time of stunning, is imperative if this type of condition is to be avoided.

It is furthermore most probable that rupture of the distended smaller blood vessels can also be caused by vigorous muscular contractions during electrical stunning or during the involuntary clonic convulsions which occur after stunning (before bleeding). Once the bleeding cut has been performed, instantaneous release of blood pressure is assured leading to less ecchymosis from occurring. It therefore makes sense to shorten the stun to bleed time to as short as possible.

Ineffective mechanical stunning (e.g. double stunning) may also lead to blood pressure being high for a longer period before bleeding, thus resulting in increased incidence of blood splash. The correct stunning equipment, including appropriate cartridge for the size of animal slaughtered, proper ergonomic design of the stun box plus operator stage to ease the stunning process, as well as easy (speedy) shackling, hoisting and bleeding, are all vital in order to address this problem.

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Finally it is also known that other factors may contribute to an increase of blood splashing, although the exact manner on how this works has not yet been sufficiently researched, e.g. climatic conditions appear to influence the incidence of this condition (it is most prevalent in hot weather), ecchymosis occurs more often in animals from certain farms and/or areas which may indicate a pasture and/or stress related problem, proper transporting and animal handling, including appropriate rest periods prior to slaughter, must all be guaranteed, whilst humidity and temperature also appear to affect blood splashing (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 area).