Assessment of key parameters for gunshot used on cattle: a pilot study on shot placement and effects of diverse ammunition on isolated cattle heads

KJ Schiffer*, SK Retz†, U Richter†, B Algers‡ and O Hensel†

† University of Kassel, Faculty of Organic Agricultural Sciences, Department of Agricultural Engineering, Nordbahnhofstrasse 1a, 37213 Witzenhausen, Germany
‡ Swedish University of Agricultural Sciences, Faculty of Veterinary Medicine and Animal Science, Department of Animal Environment and Health, PO Box 234, 53223 Skara, Sweden
* Contact for correspondence and requests for reprints: schifferkj@gmail.com

Abstract

There have been many improvements regarding transport conditions, pre-slaughter handling, and captive-bolt stunning of cattle at commercial abattoirs, but many challenges still exist. Animals unaccustomed to human-animal contact, such as free-range beef cattle, may be especially difficult to handle on the day of slaughter. Shifting of the slaughter process from the abattoir to the animals’ familiar environment could improve animal welfare at slaughter. In 2011, the German government passed an amendment allowing farmers to slaughter free-range cattle, on-farm, using a rifle. A proper stun is vital when employing this method but neither sufficient practical experience nor scientific knowledge are in place to allow this. Thus, this study aimed to examine shot placement and the effect of diverse ammunition by means of shooting at cattle heads, post mortem, with a rifle. Impact was assessed using brain tissue damage observed from skull dissections. Placing the shot frontally at the forehead resulted in severe brain damage significantly more frequently than targeting laterally. A precise frontal shot, utilising both large and small bore calibres, caused severe brain damage that would almost certainly have led to immediate unconsciousness and death. One of the small bore calibres caused minimal brain damage apart from the trajectory. However, this was the only calibre not passing straight through. Due to the fact that the bullet remains within the skull, thus transferring all of its energy to the skull and brain, the impact of this calibre on the brain would also be expected to be rapidly fatal. A projectile that does not exit the skull would also be advantageous as regards safety.

Keywords: animal welfare, brain damage, cattle, gunshot, slaughter, stunning

Introduction

Difficulties with standard cattle slaughter

The last few decades have seen many improvements in transport conditions, pre-slaughter handling, and stunning and bleeding of cattle at commercial abattoirs (Fischer 1994; Grandin 1998, 2006, 2012; Atkinson & Algers 2007, 2009). Nevertheless, concern remains regarding animal welfare during the slaughter process (Wernicki et al 2006; Hartung & Springerum 2009; von Wenzlawowicz et al 2012; Atkinson et al 2013). Whilst long road journeys can lead to habituation (Gebresenbet et al 2012), situations of acute stress, such as separation from conspecifics or unfamiliarity with the environment, frequently occur at the abattoir itself (Terlouw et al 2012). In principal, the negative impact of pre-mortal stressors on meat quality is well-known, ie dark-firm-dry meat (DFD) in cattle, but significant losses to the meat industry caused by DFD are still common. In addition, bruising, lacerations or other superficial blemishes, due mostly to unsuitable transport conditions, can lead to carcasses being downgraded (Jarvis et al 1996; Ferguson & Warner 2008; Algers et al 2009; Shen et al 2009).

Livestock unaccustomed to human contact, such as free-range beef cattle, may show heightened stress levels as a result of handling and transport processes on the day of slaughter when compared to dairy cows, for instance, which tend to be more used to human contact. A possible strategy for reducing stress in slaughter animals would be to shift the slaughter process from the abattoir to a more familiar environment for the animals, ie their pasture. Consequently, dead, as opposed to live, animals would be transported to the abattoir, where evisceration and further processing would take place. In the event of highly professional guidelines being implemented and strict control from responsible authorities, shooting would represent an humane and effective method of on-farm stunning and killing of cattle, drastically reducing pre-mortal stress (AVMA 2013; Schiffer et al 2013).