Preliminary evaluation of the effectiveness of captive-bolt guns as a killing method without exsanguination for horned and unhorned sheep

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Abstract

The current study aims to make welfare-based recommendations for gun/cartridge combinations and shooting positions that will ensure death of the sheep (horned, unhorned, rams and ewes), without the need for either sticking or pithing. The study examined the pathophysiology of captive-bolt gun (CBG) injuries that result in incomplete concussion leading to death. Behavioural, brainstem and cranial/spinal responses were examined along with gross pathology in 489 animals (116 polled ewes, 134 horned ewes, 117 polled rams and 122 horned rams) following a variety of CBG-cartridge combinations. Shooting horned rams was more challenging than horned sheep, partly because minor movements of the head at the time of shooting can result in deflection of the gun by the horns. Marksmanship was the definitive factor: 100% of animals that showed signs of incomplete concussion were found to have been shot incorrectly. The findings will have application when it is necessary to kill sheep on farms for disease control or euthanasia purposes.

Keywords: animal welfare, captive bolt, disease control, ewes, rams, sheep horned and polled

Introduction

When there is an outbreak of a serious disease in livestock, it is sometimes necessary to kill affected animals at the farm where the disease was identified and in adjacent properties in order to prevent the spread of the disease. While every effort needs to be made to ensure that the disease is contained promptly, the affected animals must be handled and killed humanely. In this situation, it is recommended that sheep (Ovis aries) are shot with a penetrative captive-bolt gun (CBG), followed immediately by a secondary procedure of either pithing (insertion of a metal or plastic rod into the CBG hole to cause physical destruction of brain tissue) or exsanguination (sticking). During the 2003 foot and mouth disease outbreak in the UK, there were anecdotal reports suggesting that a secondary procedure was not always performed. Although most animals will be rendered irrecoverably insensitive leading to death, some may not die promptly or may even show signs of shallow or incomplete concussion.

There is abundant practical experience of using CBGs for stunning sheep for human consumption, where sheep are bled after being shot. Previous work has examined the time to undoubted insensibility following penetrative and non-penetrative CBG stunning in sheep and cattle using alterations in the spontaneous electroencephalogram (EEG) (Fricker et al. 1981; Gibson et al. 2009), evoked potentials (Daly et al. 1986, 1987; Daly & Whittington 1986) and brainstem and cranial/spinal reflexes (Blackmore 1979; Fricker et al. 1981; Gouveia et al. 2009). In human medicine, brainstem and cranial/spinal reflexes are used in determining prognosis after traumatic brain injury (Owen et al. 2005).

The aim of the current study is to make welfare-based recommendations for gun/cartridge combinations and aiming points that will ensure death of sheep (horned, unhorned, rams and ewes), without the need for either sticking or pithing. The findings will have application when it is necessary to kill sheep on farms for disease control or euthanasia purposes.

Materials and methods

Sheep were sourced from commercial farms in southern England and Wales. Animals were housed indoors with access to feed and water. Experimentation was carried out under the provisions of the Animals (Scientific Procedures) Act 1986 and with the approval of the Royal Veterinary College Ethics Committee. Prior to experimentation, the wool covering the ventral aspect of the neck was clipped to permit access to the jugular veins should this be needed for euthanasia purposes.

During the experiment, 489 adult sheep (polled ewes 116, horned ewes 134, polled rams 117 and horned rams 122) of mixed weights were shot once, with either the industry recommended gun/cartridge combinations or with higher powered combinations after the failure to induce irrecoverable concussion leading to death (Table 1).