Comparison of novel mechanical cervical dislocation and a modified captive bolt for on-farm killing of poultry on behavioural reflex responses and anatomical pathology

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Abstract

An alternative emergency method for killing poultry on-farm is required following European legislation changes (EU 1099/2009), which heavily restricts the use of manual cervical dislocation. This study investigated the kill efficacy of two mechanical methods that conform to the new legislation: (i) a novel mechanical cervical dislocation device; and (ii) a modified captive-bolt device (Rabbit Zinger™) and manual cervical dislocation (the control). Killing treatments were applied to broilers and layers at two stages of production (broilers: 2–3 and 5 weeks of age; layers: 12–13 and 58–62 weeks), with a total of 180 birds. Latency to abolition of cranial and behavioural reflexes, as well as post mortem analysis of the physiological damage produced, were used to estimate time to unconsciousness and assess kill efficacy. The novel mechanical cervical dislocation device was reliable and a practical method for killing poultry on-farm (100% kill success), with the majority of cranial reflexes showing no significant differences between interval mean durations across killing methods (eg nictitating membrane [mean = 0.7–3.3 s], and rhythmic breathing [mean = 0.0–0.3 s]), however for jaw tone and pupillary reflex, the modified Rabbit Zinger™ had significantly shorter interval mean durations compared to the control and mechanical cervical dislocation device (mean differences: jaw tone ~8 s; pupillary ~38 s). The novel mechanical cervical dislocation device resulted in consistent anatomical damage to the birds (eg high dislocation of the neck and severing of the spinal cord) compared to the manual method, despite both having 100% success rate, while the modified Rabbit Zinger™ was difficult to operate and resulted in varied anatomical damage. The novel mechanical cervical dislocation device showed promise as a replacement kill method on-farm for poultry.

Keywords: animal welfare, captive bolt, cervical dislocation, killing, poultry, reflexes

Introduction

Determining the efficacy of on-farm killing methods for individual birds is essential to poultry welfare in both commercial and non-commercial contexts. Poultry may need to be killed on-farm or in backyard flocks for several reasons (eg in an emergency for small-scale disease control or injury, and for stock management). Emergency killing of large numbers of birds is often controlled by whole-house or containerised gas methods, or birds may be transported for slaughter and then slaughtered using gas or electrical water-bath stunning methods. However, for individual birds on-farm, there are two key methods for killing poultry: (i) cervical dislocation, which is designed to cause death by cerebral ischaemia and extensive damage to the spinal cord and brainstem (Ommaya & Gennarelli 1974; Gregory & Wotton 1990; Erasmus et al 2010a,b; Bader et al 2014); and (ii) percussive devices designed to cause extensive brain damage, resulting in brain death (Gregory & Wotton 1990; HSA 2004; Mason et al 2009; Erasmus et al 2010a,b; Sparrey et al 2014).

Cervical dislocation methods can be divided into two categories: (i) manual — cervical dislocation of the neck by hand (MCD); and (ii) mechanical — cervical dislocation of the neck with the aid of a tool (Gregory & Wotton 1990; Humane Slaughter Association [HSA] 2004; Mason et al 2009; Sparrey et al 2014). The most common method for despatching poultry on-farm is manual cervical dislocation (MCD) (Mason et al 2009), as it is perceived to be humane by users, easy to learn and perform, and does not require equipment. All cervical dislocation killing methods are designed to separate the skull from the vertebral column of the bird (C0–C1 vertebral dislocation), resulting in severing of the spinal cord and/or brainstem and the main blood vessels supplying the