

Using facial expression to assess pain in sheep

McLennan, K.M^{1*}, Rebelo, C.J.R¹, Corke, M.J¹, Holmes, M.A¹, Constantino-Casas, F.¹

¹Department of Veterinary Medicine, University of Cambridge

*Biological sciences, Chester University, k.mclennan@chester.ac.uk

1. Introduction

Footrot is a major source of pain in sheep causing inflammation and separation of the hoof wall from the soft tissue. Inflammation causes pain due to activation and sensitisation of sensory nerve fibres by inflammatory mediators (Fitzpatrick et al., 2006). In stoical species such as sheep, accurate and reliable recognition of pain is problematic. This results in the limited use of analgesics in farm animals (Huxley and Whay 2006; Lizarraga and Chambers 2012), significantly reducing their welfare.

The use of facial expression to assess pain in humans is well established. It is a reliable and accurate method to assess both the sensory and affective components of pain (Kunz et al., 2012). It has also been developed for use in laboratory species such as rats (Leach et al., 2012), mice (Langford et al., 2010) and rabbits (Keating et al., 2012), and recently developed for use in horses (Dalla Costa et al., 2014). The aim of this study was to validate a facial expression scale of pain in sheep suffering from naturally occurring footrot.

2. Methods

- 30 animals (20 diseased, 10 controls) assessed for lameness and lesions scored using a five point scale, at two time points; day of identification (day zero) and upon full recovery (day 90)
- Two photographs (front and profile) of each sheep at each time point were provided for assessment (n=60)
- Photographs were provided on an excel file in a random order
- Five trained, treatment blind scorers asked to score five areas of the face (Figure 1) on a three point scale of not present, partially present or present (Figure 2), over two time points (Figure 3)
- Scorers were asked to provide a global pain assessment on whether they thought the animal was in pain or not

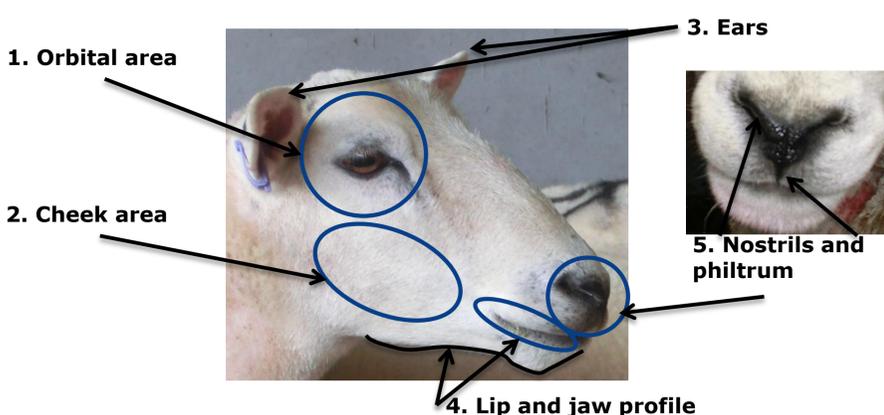


Figure 1. The five areas of the face that need to be assessed

3. Results

- The scale has a high **sensitivity** (0.84, CI: 0.77 – 0.90) with a middle range of **specificity** (0.56, CI: 0.46 – 0.63). The **ROC** analysis shows a good overall test (0.70, CI: 0.64 – 0.76).
- Inter-reliability analysis showed participants scored all areas similarly with orbital tightening and cheek tightening scoring best ($\alpha = 0.9$, $\alpha = 0.82$ respectively).
- There were no differences ($P > 0.05$) in the changes from day zero to day ninety in control animals.
- There was a decrease ($P < 0.001$) in pain expression from day zero to day ninety in diseased animals.

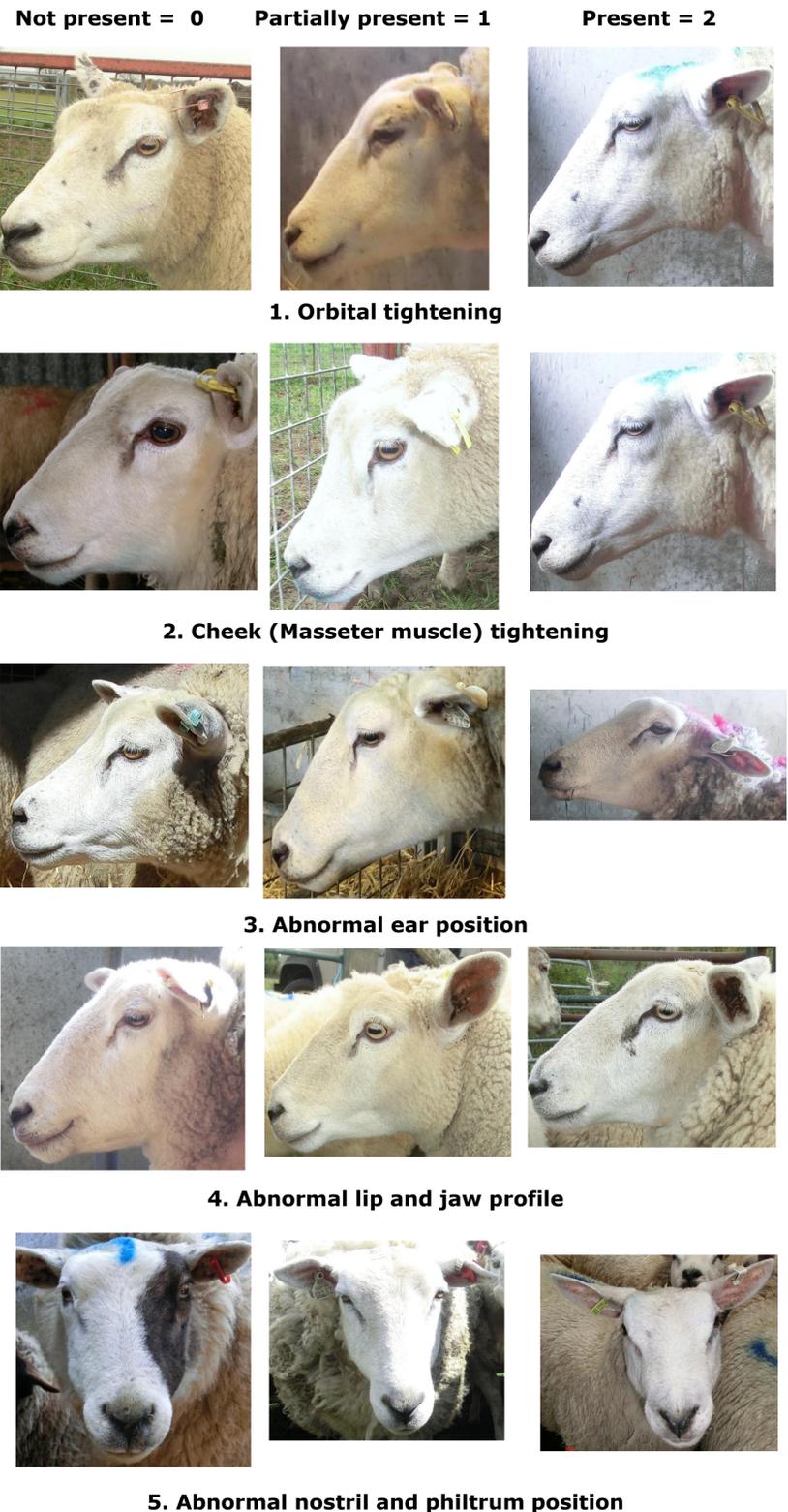


Figure 2. Facial expression scale showing the three levels of expression

4. Clinical relevance

Day of diagnosis Day 90, recovered



Figure 3. The same animal can be assessed over time

5. Conclusions

- The facial expression of sheep can be easily and immediately assessed for signs of pain using this scale.
- It is recommended for use alongside other known pain indicators such as behaviour.
- It has the potential to be used across different diseases and across time allowing treatment effectiveness to be assessed.