Animal Behaviour and Welfare Cases – Case template

Title: Pain in Sheep

Summary

Short Summary

Pain in sheep can occur for a variety reasons, including disease, injury, and naturally through parturition. Sheep, as a prey species, do not overtly express pain making it challenging for owners and veterinarians to recognise and thus effectively treat pain. By observing facial expression, it is possible to recognise and quantify the pain a sheep may be experiencing. This enables the provision of treatment and the prevention of any further suffering.

Summary (150-250 words)

Pain is a sensory and emotional experience that can significantly affect a sheep's welfare and its quality of life. Pain has a negative impact on the economics of production, through reduced feeding or weight gain, or poor mothering, which can impact both ewes and lambs (Gougoulis et al., 2008; Wassink et al., 2010). Sheep may experience pain for a variety of reasons including diseases such as footrot and mastitis, or through injury or painful husbandry practices such as castration or tail docking. As a prey species, sheep do not overtly express pain, making recognising and evaluating pain difficult.

Common methods for assessing pain in sheep focus on changes in behaviour, physiology or production. Changes are monitored over time and may not be clear, despite pain being present. Farmers and veterinarians have reported difficulty in recognising and assessing pain in farm animals (Huxley & Whay, 2006; Ison & Rutherford, 2014; Lizarraga & Chambers, 2012). Without being able to recognise pain, it cannot be assessed and therefore cannot be treated. Pain left untreated can lead to suffering and poor welfare.

Learning outcomes

1. Recognise the five areas of the face that can change in sheep when they are expressing pain.
2. Assess the changes that occur in the face when a sheep is in pain using a facial expression scale.
3. Calculate a total pain facial expression score for a sheep and identify correctly if a sheep is in pain.
4. Describe the impact of pain on sheep welfare.
5. Evaluate the use of a facial expression scale in assessing pain in sheep.

Why is this case of value?

Sheep that are in pain are in a negative welfare state. There is a legal and ethical obligation to ensure beings recognised as sentient, are not allowed to experience long-term suffering due to pain. Farmers and veterinarians report difficulties in recognising and quantifying pain in farm animals (Flecknell, 2008; Huxley & Whay, 2006; Ison & Rutherford, 2014; Lizarraga & Chambers, 2012). This can limit the use of pain relief, leading to poor welfare and negatively impacting on production

values. By using the Sheep Pain Facial Expression Scale (SPFES) developed by McLennan et al. (2016), owners and veterinarians will be able to identify and treat pain earlier, as well as monitor the effectiveness of any analgesia given. Prompt recognition and treatment is imperative to increased welfare and a reduction in suffering.

Background and context

A common source of pain in sheep is disease. Footrot is a highly contagious disease caused by the bacteria *Dichelobacter nodosus* and *Fusobacterium necrophorum* (Clifton et al., 2019) that can lead to the separation of soft tissue from the hoof horn. Treatment with systemic antibiotics is crucial to relieving lameness (Kaler, et al., 2010); however, resolution of the lesions does not necessarily remove the pain experienced, with hyperalgesia persisting in previously affected limbs for up to 90 days (Dolan et al., 2003; Ley et al., 1989).

Mastitis, caused by pathogens such as *Staphylococcus aureus* and *Mannheimia haemolytica* (Jones, 1991) is also considered painful. Inflammation occurs in the mammary gland as well painful lesions in the teat canal (Mavrogianni et al., 2004). Mechanical hyperalgesia in the limb contralateral to the inflammation also appear in sheep suffering with mastitis (Dolan et al., 2000), supporting the hypothesis that this is a painful condition.

Previous pain assessment methods commonly rely on long term behavioural changes, or spending a significant amount of time observing animals, which is not feasible for large flocks of sheep or on-farm settings. In addition, pain can fluctuate, especially in chronic conditions (Foss et al., 2006). Having a method that is quick, non-invasive and gives an indication of how an animal may feel in that moment in time is key to being able to recognise and assess pain.

Observing the changes in facial expression in sheep has been shown to be a valid and reliable method of recognising and assessing pain in sheep (Häger et al., 2017; McLennan et al., 2016). IT appears that changes that occur in the face of mammals that are in pain are highly conserved (Chambers & Mogil, 2015). There are five key areas of the face that change when pain is present that should be observed and assessed (see figure 1).

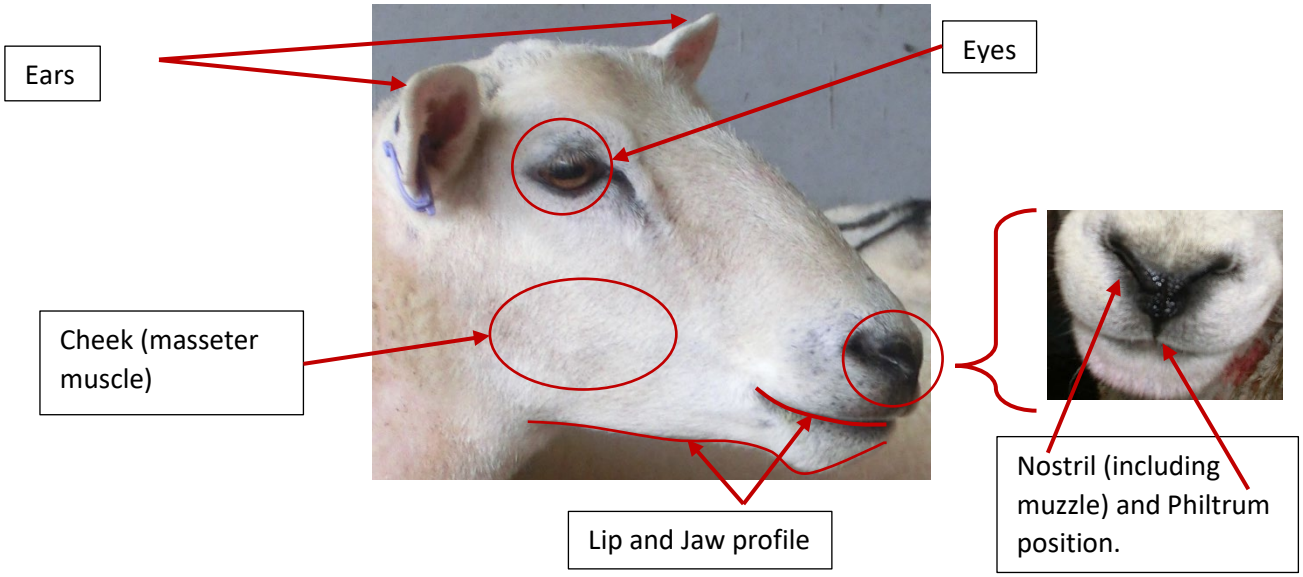


Figure 1. Five areas of the face to monitor when assessing pain.

The following figures show how each area of the face changes. Each area should be assessed independently of each other and the score noted. Try to observe the sheep from both the frontal and profile view. Changes are scored as not present (0), partially present (1) or present (2). A sheep can score a maximum of 10, where all five areas have changed. A sheep scoring more than 5 should be considered as being in pain and relief should be provided (McLennan et al., 2016).

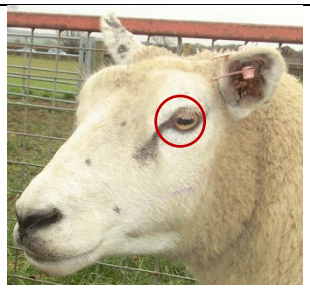
Not present 0	Partially present 1	Present 2
		

Figure 2. Orbital tightening. Note the closing of the palpebral fissure with the eyelid closed almost more than halfway for the "present" image. There is a narrowing of the eye aperture and tension in the muscle around the eye.

Not present 0	Partially present 1	Present 2
		

Figure 3. Cheek (masseter muscle) tightening. The cheek area, along the masseter muscle has a more convex shaping. The zygomatic arch also mirrors this tension with a more raised position.

Figure 4. Abnormal ear position. Views from portrait (first line) and profile (second and third line) show the ears have rotated ventrally (towards the ground) and caudally (backwards) when present. The pinna of the ear has also narrowed. Note: breeds may have differing ear positions, but the change in position is the same, e.g., a rotation and narrowing.

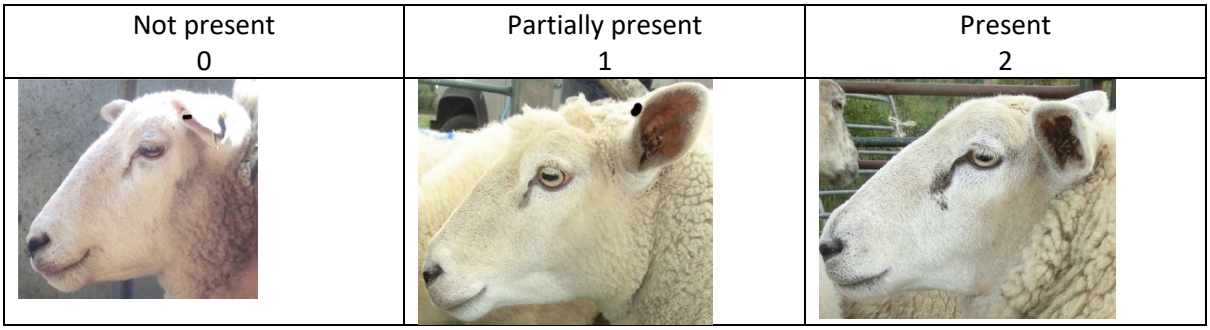


Figure 5. Abnormal lip and jaw profile. The chin and jaw line are straightened. The jaw profile appears straight to concave, and the lower lip is drawn caudally (backwards). The line of the lip towards the commissure (corner) of the mouth is straight or even rotated ventrally (towards the ground).

Not present 0	Partially present 1	Present 2
		

Figure 6. Abnormal nostril and philtrum position. As the philtrum is narrowed and shortened the upper lip profile develops a concave appearance and a "V" shape is formed between the nostrils. Note that the muzzle area will also follow this shaping, becoming more "V" like.

Questions for the owner

For the sheep below using the above scale score each area of the face. Sum together your scores for each of the five areas of the face for a total score. Compare the differences between Picture A and Picture B.

Picture A

Picture B

Figure 7. Picture A and B for scoring.

Note your scores in the following table:

Area of the face	Picture A	Picture B
Orbital tightening		
Cheek (masseter muscle) tightening		
Abnormal ear position		
Abnormal lip and jaw profile		
Abnormal nostril and philtrum position		
Total Pain Score		

Picture A was taken on the day in which the sheep was diagnosed with mastitis. Picture B is the same sheep taken 42 days after she had recovered. Note that picture B would not have scored zero. This shows the importance of scoring the same individual over time so that differences in facial expression for that one individual is considered. Your scores for each picture should have been:

Area of the face	Picture A	Picture B
Orbital tightening	2 – the upper eyelid has closed halfway across the eye. There is some tension in the lower part of the eye.	1 – Tension can be seen at the top of the eye, and the eye is not fully round. It is however open and therefore scores 1.
Cheek (masseter muscle) tightening	1 – There is some tension of the more caudal aspect of the masseter muscle/zygomatic arch.	0 – the cheek and zygomatic arch area are relaxed and flat.
Abnormal ear position	1 – The ears are drawn ventrally. They have not closed at the pinna and so should not score a 2.	0 – The ears are open and facing forward. They held up above the head.
Abnormal lip and jaw profile	1 – it is difficult to properly see and assess the profile at the angle of the image, but it is possible to note a straight jaw profile with a tightened jaw line.	1 – The profile is straight, and the chin is slightly tight. The chin has a slight triangular shape.
Abnormal nostril and philtrum position	It is not possible to score from the angle of the image.	It is not possible to score from the angle of the image.
Total Pain Score	5	2

Observe the sheep below in video 1 and consider the following questions:

1. Is this sheep in pain?
2. What is the score for each area of the face using the above scale. Score each area separately. Pause the video if required.
3. Is one side of the face scoring differently to the other? If this is the case, use the highest scoring side.
4. What is your total score?
5. The sheep turned their head to face the camera in the beginning. Rewind the video and observe the differences in the facial expression of the sheep in the first 3 seconds compared to the next 3 seconds. Did you notice a difference in their expression at all? Why might this be the case?

If your sheep scored more than 5 on the scale it would benefit from pain relief.

Place video 1 here

Observe the sheep furthest to the right (they turn to face the direction of the camera rather than the wall) in video 2 and consider the following questions:

1. The sheep is obviously lame. Do you think this will affect your judgement of whether the sheep is in pain or not?
2. Observe the changes that occur in the sheep's facial expression over the course of 14 seconds. Why might the sheep change their facial expression this way?
3. How would you score this sheep on the pain scale and why?
4. What is the score for each area of the face using the above scale. Score each area separately. Pause and replay the video if required.
5. Is this sheep in pain?

Place video 2 here

Discussion points

What were the main differences between video 1 and video 2? Any assessor needs to consider the context in which the behaviour is occurring. The sheep on video 1 was in a pen with other sheep around but was being filmed directly with a human present. In the first few seconds of the video the sheep turns to face the camera and their eyes widen and ears are held more vertically. The presence of a human can affect the facial expression of a sheep. As a prey species, they do not want to overtly express any weakness in the presence of a predator.

In video 2 the sheep was outside with others in the holding area and was being filmed remotely without the presence of a human. You should have noted that the weather on the day was windy, which can affect an animal's ability to properly hear around them. The sheep we were observing moved their ears around several times. In addition, as the sheep moved and we noted obvious lameness, the facial expression of the sheep again changed – this could be due to a heightened pain sensitivity when stepping onto the affected limb.

You may have found it difficult to assess each area of the face properly in the videos compared to the photograph in figure 7. Research by Miller & Leach, (2015) found differences in scoring mice live compared to using photographic images; however, others (Dalla Costa et al., 2016; Leung et al., 2016) have found no differences. It is recommended that multiple observations of the same sheep are made over a longer period to fully assess the pain, and if pain relief or other treatment has been provided, multiple observations should be made so that the effectiveness of that treatment is monitored.

Discussion questions

1. Are there any contexts that you can think of that could affect the way a sheep might express pain?
2. How might the early identification of pain help to prevent suffering not only in the sheep experiencing the pain directly, but also others in the flock?
3. Where (e.g., in the field, in the barn, in a group) do you think the use of facial expression assessment may be most useful?
4. Do you think there may be other reasons that the sheep are changing their facial expression that is not pain related?
5. Could we use the SPFES (McLennan et al., 2016) to assess other affective states?

Courses of action and treatment

Sheep that are identified as being in pain must receive appropriate treatment as per the Animal Welfare Act 2006 (UK based). By not providing adequate treatment, the sheep will experience unnecessary suffering. Where a sheep is identified to have scored a total pain facial expression above 5, they should be considered as being in pain and provided the most appropriate treatment (McLennan et al., 2016).

What treatment is provided is influenced by the initial cause of the pain. Investigation into the direct cause of the pain is required. This may mean looking over the animal closely, such as assessing udders or feet in the case of mastitis or footrot, respectively. Diseases such as mastitis and footrot that are caused by bacteria, will need to be treated with antibiotics. For conditions such as footrot, the provision of non-steroidal anti-inflammatory drugs has not been seen to significantly affect the recovery of sheep from footrot lesions (Kaler, et al., 2010). In other conditions, such as after abdominal surgery (Silva et al., 2020), or after the castration (Colditz et al., 2019), the use of analgesia as well as anaesthetic drugs has been more successful at relieving pain.

Once the most appropriate treatment has been applied, the sheep's facial expression should be scored on a regular basis. This could be at 12-hour intervals until the initial cause of the pain has been relieved. Thereafter a daily observation and scoring can be carried out. This can be time consuming. The development of an automatic detection of facial expression system is currently under development to help deal with this situation (McLennan & Mahmoud, 2019; Pessanha et al., 2020).

Conclusions

Pain in sheep can be difficult to recognise and assess. The SPFES offers an easy and reliable method of assessing the five key areas of the face that have been seen to change when pain is present. Using the scale, it should be possible to reliably and consistently identify pain in sheep and to assess its impact on the animal. The observer should feel confident in when further investigation and treatment may be required. In order to ensure the welfare of sheep are maintained, it must be recognised that sheep do express their current affective state through facial changes.

Further reading

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Acknowledgements

The author would like to thank the EU VII Framework Programme (FP7-KBBE-2010-4) for funding the initial study as part of the AWIN project. Thanks are also given to Boehringer Ingelheim Ltd for providing the meloxicam used in developing the SPFES study. Thanks are also provided to the participating farmers for allowing us to collect data from their farms.