Available online at http://journal.bajas.edu.iq

College of Agriculture, University of Basrah

DOi:10.21276/basjas

Basrah Journal of Agricultural Sciences

ISSN 1814 – 5868 Basrah J. Agric. Sci., 32(1): 25-33, 2019 E-ISSN: 2520-0860

Changes in Ear Postures of Kid Goats in Response to Ear Tagging

Nizar J. Hussein[1*] & Hoger M. Hidayet[2]

[1] Department of Environmental Science, Faculty of Science, University of Zakho, Duhok, Kurdistan Region, Iraq.

[2] Department of Pathology and Microbiology, College of Veterinary Medicine, University of Duhok, Kurdistan Region, Iraq.

***Corresponding author e-mail:** nizar.hussein@uoz.edu.krd

Received 28 March 2019; Accepted 1 May 2019; Available online 2 March 2019

Abstract: No study yet is undertaken to measure pain caused by ear tagging in kid goats using ear postures. Therefore, the purpose of this study was to elucidate the effect of ear tagging procedure on pain in black Karadi kids using ear position and frequency of ear changes. Twenty black Karadi kids, aged 10-14 days, were used in this study. Ear postures were scored using focal sampling and recorded with instantaneous time sampling to measure the duration of each ear posture. Each kid was observed separately for 6 minutes before and 6 minutes after the ear tagging process with 30 seconds intervals. A total of 24 ear posture samples were recorded from each kid. Results revealed that Ear tagging significantly increased ears backward ($P<0.01$) and decreased ears plane ($P<0.001$). However, no significant effect of ear tagging was found on ears forward ($P<0.19$) and asymmetrical postures ($P<0.43$). In addition, number of ear posture changes was significantly ($P<0.001$) increased after ear tagging. It was concluded that observing ear postures of kids directly after painful husbandry procedures such as ear tagging is a reliable non-invasive method to assess pain caused by these painful methods and hence helps better understands animal welfare.

Keywords: Ear Postures; Kid Goats; Pain; Ear Tagging; Welfare.

Introduction

When there is no problem to deal with an animal, that animal is possibly in a good state, where it involves physiological functioning, good behaviour, physical condition and good feelings. Pain is apparently a crucial part of animal welfare. Pain can indicate that there is an effect on the brain with the environment outside the brain control system and indicates that animal has difficulties in coping in either the short or long-term (Broom, 2009). In animals, pain has been defined, according to Molony & Kent (1997) as “an aversive sensory and emotional experience, it changes the animal’s physiology and behaviour to reduce or avoid damage, to reduce the likelihood of recurrence and to promote recovery".

Farm animals feel pain during routine husbandry procedures such as castration, disbudding, ear tagging and tail docking (Molony *et al*., 2002; Hussein, 2015, Guesgen *et al*., 2016; Hempstead *et al*., 2018). It is well published that animals when have a pain increase the release of cortisol hormone and show pain-related behaviours include tail wagging, abnormal postures, rolling, lip curling and statue standing (Molony *et al*., 2012; Hussein, 2015); however, their normal behaviour is improved by classical music (Meshabaz *et al*., 2017). There is, recently, a growing interest of using face-related behaviour using ear posture and ear changes in farm animals (Proctor & Carder, 2014; Guesgen *et al*., 2016; McLennan *et al*., 2016). In small ruminants, ears are important to obtain information from their environment (Manteuffel, 2004). Ear posture, in other words the frequency of changing ear postures, is also related to animal emotions (Guesgen *et al*., 2016). In cows, ear postures indicated positive emotional state by stroking different body parts of cows (Proctor & Carder, 2014). In a study by Boissy *et al*. (2011) revealed that animals in negative situations under controlled conditions, where they are able to access food through photo-beam, spent more time with ears being forward, whereas when the condition is uncontrolled, the animals unable to access food, spent more time with backward ear postures.

Painful husbandry procedures, such as tail docking, in lambs was associated with more time spent ears backward (Guesgen *et al*., 2016). Contrarily, sheep with negative emotional state during separation from the flock had spent more time with ears forward (Stubsjøen *et al*., 2009). Facial grimace scale, including ear posture, was recently used in rabbits, horses, mice, rats, lambs and ewes (Sotocinal *et al*., 2011; Matsumiya *et al*., 2012; Keating *et al*., 2012; Dalla Costa et a1., 2014; McLennan *et al*., 2016). In all studies, all animal species spent more time ears backward. This suggests that ear postural changes may be a useful indicator of pain in kid goats. To date, many studies were undertaken to measure positive and negative emotions and pain in sheep using ear changes and surface temperature (Hussein, 2018; Reefrnann *et al*., 2009; Stubsjøen *et al* 2009; Guesgen *et al*., 2014; 2016; Molony & Kent, 1997, Kent *et al*., 2001; Molony *et al*., 2012). Observing changes in ear postures of animals is a valuable indicator to be non-invasive.

Most of the studies that are concerned with animal welfare on routine painful husbandry procedures conducted on domestic animals have focused mainly on tail docking, castration and disbudding. In contrast, ear tagging as a routine husbandry procedure for animal identification has a minimal attention (Leslie *et al*., 2010). However, to the authors' information, no study yet is undertaken to measure pain caused by ear tagging in kid goats using ear postures. The Black goat is distributed in all Iraq, particularly in Kurdistan region. Its colour varies with a dominance of black or grey. Karadi goat is medium-sized and suitable for grazing over large areas. It is raised largely for its milk and meat (Alkass & Juma, 2005). The hypothesis of the pain caused by ear tagging procedure might be associated with more time spending with ears backward. Therefore, the purpose of the present study is to elucidate the effect of ear tagging procedure on pain in Karadi kids placed with their dams using ear position and frequency of ear changes.

Materials and Methods

Ethical consideration

The process of ear tagging as a routine husbandry procedure was ethically approved by Animal Ethics Committee at the University of Zakho.

Subjects and general care

Twenty native black Karadi kids, aged 10-14 days, were used in the present study. The study was undertaken at the Animal Project Farm of Animal Production Department at College of Agriculture at University of Duhok in March 2019. Does and kids were remained together for one week from the birth at the birth halls at the farm to facilitate suckling and bonding; then, they were moved to the project and each goat and its kid were placed at individual pen (1.5 * 2 m) for two weeks as a habituation period. All participated kids were singletons as there were no twins during kidding.

Ear tagging procedure

All twenty kids were allocated to ear tagging procedure. Normal ear tags used in Kurdistan were used to identify kids. Ear tags (PrimaFlex Ear Tags, Germany) were applied using ear tagging pliers (PrimaFlex Ear Tag Pliers, Kerbl, Germany) to slightly above the centre of the left ear of each kid and the tag number was then recorded for future identification. Firstly, a kid was handled and placed outside the pen. One person restricted a kid to prevent its ear from injuries once it was tagged and another person applied the tags. Thereafter, a tagged kid was directly placed at the pen with its dam.

Ear postures recording

Ear postures were scored using focal sampling and recorded with instantaneous time sampling to measure the duration of each posture of the ears. Each kid was observed separately for 6 minutes before and 6 minutes after the ear tagging process with the intervals of 30 seconds. A total of 24 ear posture samples were recorded from each kid. The sampling interval was 30 seconds selected relying on previous studies undertaken with measuring ear postures (Reefrnann *et al*., 2009; Stubsjøen *et al*., 2009; Veissier *et al* 2009; Boissy *et al*., 2011; Guesgen *et al*., 2016). The time spent with ear postures of four positions is shown in Table (1) and Fig.(1).

Statistical analysis

All recorded ear posture data were projected to Microsoft Excel spreadsheet so as to be analysed. Data were analysed using GenStat Software Programme (17^{th} edition, VSN International Ltd, UK). A summary statistics was obtained from Past3 software programme (Paleontological Statistics, Version 3.17) to be analysed (Folk.uio.no., 2016) Depending on Shapiro-Wilk test of the normality, ear posture position and ear posture changes data were non-parametric, therefore they were analysed individually using a two-sample nonparametric test by using Mann-Whitney U-test to obtain differences between all ear postures in before and after ear tagging process. All figures were obtained from the Past3 software programme.

Table (1): Behaviours that are related to the ear scored for focal kid, based on Guesgen *et al.* (2016). State postures scored as duration and event postures as frequency.

Ear Postures	Description
State postures	
Ears asymmetrical	The right and left ears are positioned differently from one another, one moves forward and the other moves backward.
Ears forward	Both ears of a kid are positioned forward of the perpendicular. This is often associated with the ear auricles facing forward
Ears backward	Both ears are positioned behind the perpendicular. The ear auricles are not visible from the front.
Ears plane	Both ears of a kid are perpendicular to the head-rump axis. This is frequently related with the ear auricle facing down.
Event postures	
Ear change	The number of times ear position changed from one of the states mentioned above to another.

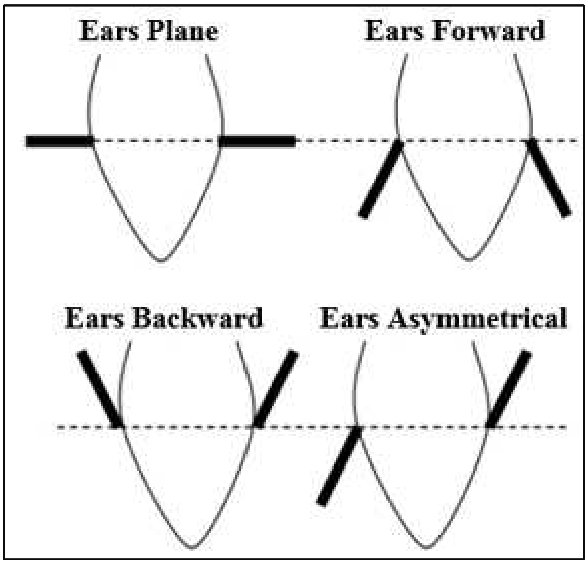

Fig. (1): Illustrates the ear position in relation to frontal head's plane (adapted from Boissy *et al*., 2011).

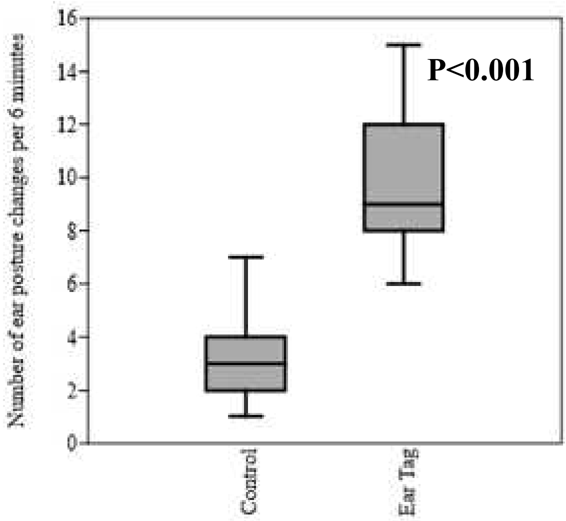

Fig. (2): Number of ear posture changes of Karadi kid goats in before (control) and after ear tagging procedure.

Results

Fig. (2) shows the effect of ear tagging on the frequency of ear posture changes. Number of ear posture changes was significantly (P<0.001) increased after ear tagging. The mean number of posture changes before and after ear tagging process were 3.3 ± 0.4 and 9.8 ± 0.6 respectively (Fig. 2).

All scored ear postures are illustrated in Fig. (3). Ear tagging significantly increased ears backward (P<0.01) and decreased ears plane (P<0.001). However, no significant effect of ear tagging was found on ears forward (P<0. 19) and asymmetrical postures (P<0.43).

The mean time spent in ears in plane position in 30 seconds intervals for 6 minutes before and after ear tagging were 25.3 ± 1.5 and 11.8 ± 2.1 seconds, respectively. The mean time spent in ears forward was 3.6 ± 0.9 seconds for control (before tagging) and was 6 ± 1.3 seconds after ear tagging. While for ears backward in before and after ear tagging were 0.7 ± 0.2 and 11.6 ± 1.7 seconds respectively. Finally, the mean time spent in ears asymmetrical was 0.3 ± 0.1 before tagging and 0.6 ± 0.2 after ear tagging procedure (Fig. 3).

The proportion of time spent with each ear posture is shown in Fig.(4). Kid goats spent 84% of their time with ears plane before ear tagging and this was decreased to 39% after ear tagging procedure. Whereas, kids spent 12, 2.5 and 1.5% of their time with ears forward, backward and asymmetrical positions, respectively. After ear tagging, the proportion of ears forward increased to 20%, the proportion of ears backward increased to 39%, and the percentage of ears asymmetrical slightly increased, which was 2% (Fig. 4).

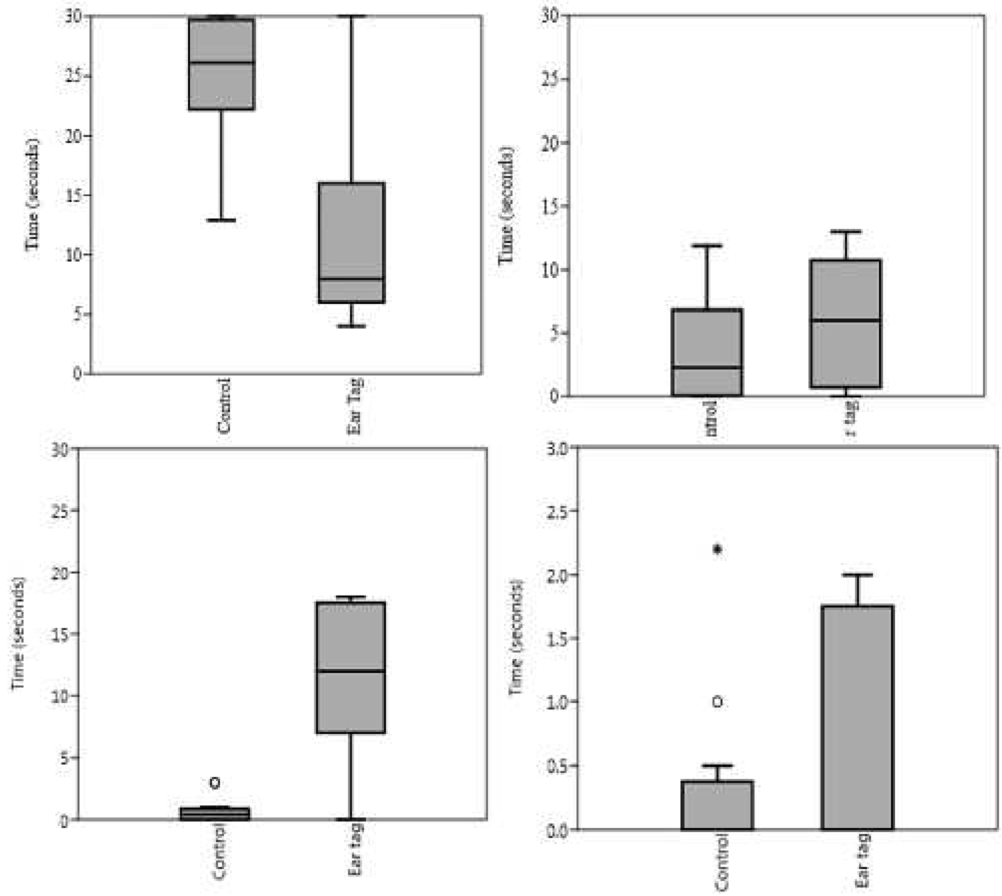

Fig. (3): The box-plots of medians of the effect of ear tagging procedure on the mean time spent in each posture of ear position of native black kid goats in 30 seconds intervals. Note: white points represent moderate outliers and black points represent extreme outliers.

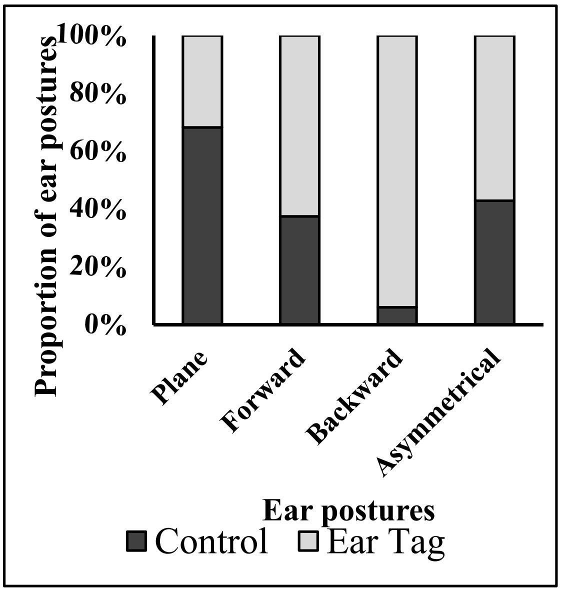

Fig. (4): Proportion of time spent with each of the four ear postures by kid goats in before and after ear tagging procedure.

Discussion

The application of ear tagging increased number of ear changes significantly. In addition, it decreased the mean time spent in ears plane and increased ears backward considerably; however no significant change was shown in the ears in asymmetrical and forward positions.

Reefmann *et al*. (2009) scored ear postures of sheep to detect their emotional valence for negative and positive situations. At negative situations, the number of changes in ear posture (11 changes) were increased compared to feeding situation (4.5 changes). In addition, the percentage of asymmetric and forward ear postures were high. While plane and forward ear postures seldom happened. In contrast, in positive situations, the number of ear posture changes were lower than negative situation, and a low percentage of asymmetric ear position and a high percentage of forward ear postures. In this study similar results were found with ear posture changes compared to Reefmann *et al*. (2009) findings showed that during negative situation ear changes was higher after ear tagging. Whereas no significant effect of ear tagging was found on asymmetric and forwards ear positions in this study.

A study by Guesgen *et al*. (2016) revealed that application of tail docking with rubber rings of lambs was related with increasing in the percentage of time spent with ears backward and decreasing in ears forward and plane posture. The results of this study are in line with the findings of Guesgen *et al*. (2016). In addition, Guesgen *et al*. (2016) found that the number of ear posture changes was significantly increased after tail docking procedure. Similar effect was found in the present study in number of ear posture changes with ear tagging procedure on kid goats. The findings of the present study are not similar to the findings of Stubsjøen *et al*. (2009) who revealed that sheep spends more time with ears forward when it was separated from the flock, which is a negative emotional state. The findings of this study are consistent with the studies of other animal species, including horses, rabbits, sheep and lambs, in which they spent more time with ears in backward position when experiencing pain (Keating *et al*., 2012; Dalla Costa *et al*., 2014; Guesgen *et al*., 2016; McLennan *et al*., 2016). Similarly, in previous studies of cattle and silver foxes with negative situations such as a stressful social learning task and physical capture were associated with ears backward (Moe *et al*., 2006; Coulon *et al*., 2011). Contrarily, cattle with positive emotions, that is stroking different body parts, spent more time with ears in backward position (Proctor & Carder, 2014).

The results of ear posture changes and position in the present study support the theory that negative situations (pain or emotions) effects ear postures (Boissy *et al*., 2011; Guesgen *et al*., 2016). Lambs involuntarily moves their ears backward (Guesgen *et al*., 2016). Similarly, sheep having diseases such as mastitis had increased the backward ear posture (McLennan *et al*., 2016). Therefore, in this study, kid goats had spent more time with ears backward posture. After ear tagging, kids had more number of ear posture changes and held its ears in backward posture, although a kid might still be motivated so as to stay alert to its surrounding environment that needs ears to be moved forward. Thus, these changes in ear postures represent the motivation's strength in order to display the behaviours that are related to pain such as head turning, rolling and restlessness (Guesgen *et al*., 2016). It was shown that ear postures is a good tool, as it is non-invasive, for the assessment of emotional valence and painful situations such as tail docking in sheep and lambs (Reefmann *et al*., 2009; Guesgen *et al*., 2016). Therefore, ear posture of kid goats during ear tagging application is a good indicator for assessing animal welfare.

Ear postures as a tool for welfare assessment is more advantageous than physiological measures (Reefmann *et al*., 2009). This is mainly because ear postures as indicator of emotions and pain are not influenced by physical activity or diurnal physiological fluctuations as physiological measures such as heart rate or glucocorticoids (Chan *et al*., 2007; Reefmann *et al*., 2009). Such a convenient and non-invasive method, that animals are freely moved, of assessing the welfare of domestic animals, including sheep and goats, should serve to better understand an animal experiences as unpleasant (i.e. negative emotional state and pain) in animals housing environment. Hence, it ought to establish the base for comprehending and improving the existing husbandry and housing conditions from an animal's viewpoint (Boissy *et al*., 2011).

Conclusion

This study offers some understanding into expression of pain by kid goats. This supports the pain-related facial expression in domestic farm animals include sheep and goats. Observing ear postures of kids directly after painful husbandry procedures such as ear tagging is a reliable non-invasive method to assess pain caused by these painful methods and hence helps better understands animal welfare. It was found in this study that kids when experiencing pain after ear tagging point their ears more backward and decrease time spent with their ears being in plane situation.

Acknowledgements

The authors are thankful to staff of Department Animal Production Department, College of Agriculture, University of Duhok. To Mr. Kawa Y. Merkhan for his support throughout the study.

References

Alkass, J.E. & Juma, K.H. (2005). Small Ruminant breeds of Iraq, Pp: 63-101 In: Iniguez, L. (Ed.). Characterization of Small Ruminant Breeds in West Asia and North Africa. Vol. 1. West Asia. International Center for Agricultural Research in Dry Areas (ICARDA), Aleppo, Syria: 462pp.

Boissy, A.; Aubert, A.; Désiré, L.; Greiveldinger, L.; Delval, E. & Veissier, I. (2011). Cognitive sciences to relate ear postures to emotions in sheep. Anim. Welfare, 20(1): 47-56.

Chan, H. L.; Lin, M. A.; Chao, P. K. & Lin, C. H. (2007). Correlates of the shift in heart rate variability with postures and walking by time–frequency analysis. Comput. Methods Programs Biomed., 86(2): 124-130.

Coulon, M., Deputte, B. L., Heyman, Y., & Baudoin, C. (2009). Individual recognition in domestic cattle (Bos taurus): evidence from 2D-images of heads from different breeds. PLoS One, 4(2): e4441.

Dalla Costa, E.; Minero, M.; Lebelt, D.; Stucke, D.; Canali, E. & Leach, M.C. (2014). Development of the Horse Grimace Scale (HGS) as a pain assessment tool in horses undergoing routine castration. PLoS ONE, 9(3): e92281. https://doi.org/10.1371/journal.pone.0092281.

Folk.uio.no. (2016). Past3 Programme: https://folk.uio.no/ohammer /past/.

Guesgen, M.J.; Beausoleil, N.J.; Minot, E.O.; Stewart, M. & Stafford, K.J. (2014). Social context and other factors influence the behavioural expression of pain by lambs. Appl. Anim. Behav. Sci., 159: 41-49.

Guesgen, M.J., Beausoleil, N.J., Minot, E.O., Stewart, M., Stafford, K.J., & Morel, P.C.H. (2016). Lambs show changes in ear posture when experiencing pain. Anim. Welfare, 25(2): 171-177.

Hempstead, M.N.; Waas, J.R.; Stewart, M.; Cave, V.M. & Sutherland, M.A. (2017). Behavioural response of dairy goat kids to cautery disbudding. Appl. Anim. Behav. Sci., 194: 42-47.

Hempstead, M.N.; Waas, J.R.; Stewart, M., Cave; V.M. & Sutherland, M.A. (2018). Evaluation of alternatives to cautery disbudding of dairy goat kids using physiological measures of immediate and longer-term pain. J. Dairy Sci., 101(6): 5374-5387.

Hussein, N.J. (2015). Using infrared thermography, behavioural observations and salivary cortisol for assessment of pain caused by castration in lambs. M. Sc. Dissertation. Coll. Writtle, Univ. Essex., U.K.: 110pp.

Hussein, N.J. (2018). Using eye and nasal temperatures to measure positive emotions in free-range hamdani sheep. Basrah J. Agric. Sci., 31(2):24-30.

Keating, S.C.; Thomas, A.A.; Flecknell, P.A. & Leach, M.C. (2012). Evaluation of EMLA cream for preventing pain during tattooing of rabbits: changes in physiological, behavioural and facial expression responses. PloS ONE, 7(9): e44437. https://doi.org/10.1371/journal.pone.0044437

Kent, J.E.; Molony, V. & Graham, M.J. (2001). The effect of different bloodless castrators and different tail docking methods on the responses of lambs to the combined burdizzo rubber ring method of castration, Vet. J., 162(3): 250-254.

Leslie, E.; Hernández-Jover, M.; Newman, R. & Holyoake, P. (2010). Assessment of acute pain experienced by piglets from ear tagging, ear notching and intraperitoneal injectable transponders. Appl. Anim. Behav. Sci., 127(3-4): 86-95.

Manteuffel, G. (2004). Positive emotions of animals: problems and chances of scientifically grounded welfare-improvement. KTBL SCHRIFT, 448: 9.

Matsumiya, L.C.; Sorge, R.E.; Sotocinal, S.G.; Tabaka, J.M.; Wieskopf, J.S.; Zaloum, A.; King, O.D. & Mogil, J.S. (2012). Using the Mouse Grimace Scale to re-evaluate the efficacy of postoperative analgesics in laboratory mice. J. Am. Assoc. Lab. Anim. Sci., 51(1): 42-49.

McLennan, K.M.; Rebelo, C.J.; Corke, M.J.; Holmes, M.A.; Leach, M.C. & Constantino-Casas, F. (2016). Development of a facial expression scale using footrot and mastitis as models of pain in sheep. Appl. Anim. Behav. Sci., 176: 19-26.

Meshabaz, R.A.; Hussein, N.J.; Mersham, M.A. & Mhamed, M.S. (2017). Effect of using two music types on non-pregnant non-lactating Arabi ewes behaviour as a tool for welfare improvement. Sci. J. Uni. Zakho, 5(4): 301-306.

Moe, R.O.; Bakken, M.; Kittilsen, S.; Kingsley-Smith, H. & Spruijt, B.M. (2006). A note on reward-related behaviour and emotional expressions in farmed silver foxes (*Vulpes vulpes*) basis for a novel tool to study animal welfare. Appl. Anim. Behav. Sci., 101(3-4): 362-368.

Molony, V. & Kent, J.E. (1997). Assessment of acute pain in farm animals using behavioral and physiological measurements, J. Anim. Sci., 75: 266-272.

Molony, V.; Kent, J.E. & McKendrick, I.J. (2002). Validation of a method for assessment of an acute pain in lambs, Appl. Anim. Behav. Sci., 76(3): 215-238.

Molony, V.; Kent, J.E.; Viñuela-Fernández, I.; Anderson, C. & Dwyer, C.M. (2012). Pain in lambs castrated at 2 days using novel smaller and tighter rubber rings without and with local anaesthetic. Vet. J., 193(1): 81-86.

Proctor, H.S., & Carder, G. (2014). Can ear postures reliably measure the positive emotional state of cows?. Appl. Anim. Behav. Sci., 161: 20-27.

Reefmann, N.; Kaszàs, F.B.; Wechsler, B. & Gygax, L. (2009). Ear and tail postures as indicators of emotional valence in sheep. Appl. Anim. Behav. Sci., 118(3-4): 199-207.

Sotocinal, S.G.; Sorge, R.E.; Zaloum, A.; Tuttle, A.H.; Martin, L.J.; Wieskopf, J.S.; Mapplebeck, J.C.; Wei, P.; Zhan, S.; Zhang, S. & McDougall, J.J. (2011). The Rat grimace scale: A partially automated method for quantifying pain in the laboratory rat via facial expressions. Mol. Pain, 7(1): 55.

Stubsjøen, S. M.; Flø, A. S.; Moe, R. O.; Janczak, A. M.; Skjerve, E.; Valle, P. S. & Zanella, A. J. (2009). Exploring non-invasive methods to assess pain in sheep. Physiol. Behav., 98(5): 640-648.

Veissier, I.; Boissy, A.; Désiré, L. & Greiveldinger, L. (2009). Animals' emotions: studies in sheep using appraisal theories. Anim. Welfare, 18(4): 347-354.