Quantitative Sensory Testing for assessing wound pain in livestock

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Quantitative sensory testing (QST) is a widely used, validated technique that we have adapted for our research to record the evolution and distribution of pain from mulesing, tail docking and/or castration wounds and their response to topical anaesthetic Tri-Solfen® (TA). It is an objective, repeatable form of pain assessment enabling the assessor to distinguish between various analgesic interventions. Von Frey monofilaments are calibrated to bend at a predetermined pressure in order to provide repeatable pain stimulation of predetermined sites on the wound and surrounding skin. Responses are scored using a customized numerical rating scale (NRS), by monitoring induced involuntary motor reflexes in the rump and head. An electronic anaesthesiometer was used to measure pain by means of pressure transduction. Pain threshold was automatically recorded as maximum pressure (g) exerted before animal response and withdrawal. We performed QST using mechanical stimulation with both von Frey monofilaments and electronic anaesthesiometer to evaluate hypersensitivity after surgery in lambs (castration, tail docking, mulesing) and calves (castration). A strong decrease in mechanical thresholds proximal and distal to the wound was indicative of pain. Results indicate that significant wound anaesthesia is achieved within 1 min of mulesing and castration. Three trials have shown that lambs treated with TA had significantly lower mean NRS response scores to von Frey stimulation of their mulesing, castration and/or tail-docking wounds up to 24 hours post-surgery (NRS score < 2, $p<0.01$). Untreated lambs had significant development of hypersensitivity within 1 min of surgery (NRS score <15, $p<0.01$). In a fourth trial, we found that beef calves treated with TA had significantly lower mean NRS scores to castration, and significantly higher mechanical pressure threshold of the wound than untreated calves ($p<0.01$). This presentation will use our findings to explain how quantitative sensory testing provides us with an important tool for understanding the generation and development of wound pain, and for clinically assessing and quantifying animal pain. With this method of pain assessment we have shown that TA can be easily incorporated into farm husbandry procedures to significantly improve livestock welfare.