Title: Evaluation of Analgesia Efficacy in Piglets Undergoing Castration and Processing-NPB #15-023

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Scientific Abstract

Each year in North America hundreds of millions of piglets are surgically castrated and tail docked to minimize boar taint and aggression, and tail biting among littermates, respectively. While these procedures are known to be painful, and legislation in some countries mandates that piglets be provided with appropriate analgesia to control post-procedural pain, many piglets are not given anything for pain relief, resulting in a poor welfare outcome. However, while there has been significant interest in this area, scientific papers are lacking with regards to appropriate analgesics for use in piglets undergoing these procedures. This has made it difficult for veterinarians to provide suitable analgesia recommendations to producers. The objectives of this research project were to determine whether common analgesic drugs could be used to mitigate castration and tail-docking pain in piglets, and if so, which drug(s) and dose would be most efficacious. An additional question was whether there are differences in how boars and gilts respond to pain and pain treatments. We also developed a novel Piglet Grimace Scale (PGS) to be used as a noninvasive tool to assess piglet pain and to replace the gold standard but highly laborious detailed behavioral scoring methods. This research project sought to further validate the PGS. A pilot study of 8-day old piglets instrumented with a percutaneous jugular venous catheter (under isoflurane anesthesia) was conducted for pharmacokinetic evaluation of 1.0mg/kg meloxicam (2.5x the current recommended dose) and to ensure that this dose was safe to administer to piglets in future trials. All castration and tail docking trials followed the same methods. The day prior to the procedure, piglets were weighed and marked with a number and symbol. Video cameras were set up on tripods outside of each farrowing pen. On the day of the castration or tail docking, 5-day old piglets were first video-recorded for 30mins. They were then removed from their pen and given an intramuscular injection of drug and/or topical anesthetic on their scrotum or tail (depending on which procedure was being done). 20mins elapsed and then the piglets were surgically castrated or tail docked. Piglets were recorded for 8h immediately post-procedure and then for 1h, 24h after the castration or tail docking. Twenty-one behaviors and postures were scored continuously for the first 15mins of every hour. Still images of piglet faces were also pulled from the videos (those pulling the faces were unaware of piglet treatments) and scored by observers without knowledge of piglet treatment using the Piglet Grimace Scale. Vocalization data was collected at three points during several of the definitive trials: when the piglets were being marked, when they were injected and when they were castrated or tail docked. Data was subsequently evaluated and scored for duration and intensity of vocalization using Raven software. Two nonsteroidal, antiinflammatory drugs (NSAIDs) (meloxicam and ketoprofen), two opioids (butorphanol and buprenorphine) and one topical anesthetic (lidocaine cream) were evaluated for their
effectiveness at reducing castration or tail docking pain alone. Subsequently, drugs of different classes were combined to create a multi-modal approach to pain management. Behavioral data was analyzed with Observer software using a generalized linear mixed model with repeated measures and a post-hoc Tukey test. A mixed procedure model with repeated measures and a post-hoc Tukey test was used for both PGS and vocalization analyses. To date, our results have indicated that common, NSAIDs labelled for use in piglets were ineffective in reducing pain in piglets undergoing surgical castration. Butorphanol caused adverse side effects (piglets were groggy and vomited) and was eliminated from future trials. Buprenorphine was highly effective at reducing castration pain, with no apparent side effects, and a multi-modal approach to pain management (NSAID + opioid + topical) was the most effective at reducing pain-associated behaviors. Further, results of the PGS scoring were highly correlated with piglet pain behaviors. Despite this, piglets demonstrated significant pain-associated behaviors at 24h post-castration, suggesting that a single treatment of an effective analgesic on the day of castration is likely insufficient for appropriately controlling pain in piglets. Results are still being generated from the data collected for the tail docking trial. The results of this research will allow more appropriate recommendations for piglet pain control after surgical castration and tail docking.