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LONG-TERM EFFECTS OF PIGLET TOOTH RESECTION ON MOLECULAR MARKERS OF INFLAMMATION AND PAIN IN TOOTH PULP

ARL Sinclair [1], RB D'Eath [1], PJ Brunton [2], A Prunier [3] and DA Sandercock [1]

[1] Animal and Veterinary Science Research Group, Scotland's Rural College (SRUC), Edinburgh, UK
[2] UMR PEGASE, Institut National de la Reserches Agronomique (INRA), Saint Gilles, France
[3] Division of Neurobiology, The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, UK
anna.r.sinclair@sruc.ac.uk

Resection (ie part removal) of piglet needle teeth is a common procedure aimed at minimising injuries sustained by piglets and sows during feeding competition which can lead to infections and productivity losses. However, negative consequences such as local inflammation and infection have been reported, making tooth resection a potential source of pain and distress. Long-term effects of two methods of tooth resection (clipping and grinding) on tooth integrity and markers of inflammation and pain were investigated. Forty-eight female piglets from 8 replicates (litters) were assigned to one of three treatments (SHAM, GRIND, CLIP). Tooth integrity was scored post-mortem at 1 or 6 weeks after tooth treatment (n=8/treatment/time-period). Pulp was extracted from 384 teeth (8/pig), pooled and processed at the pig level to quantify relative changes in gene expression of C-X-C motif chemokine ligand 8 (CXCL8) and calcitonin related polypeptide beta (CALCB) as neuropeptide markers of inflammation and pain using RT-qPCR. All CLIP and GRIND piglets exhibited pulp exposure. Mean percentage numbers of needle teeth with exposed pulp were 0.8%, 65.8%, and 85.8% in SHAM, GRIND, and CLIP respectively. CXCL8 gene expression was significantly increased (p<0.001) by both resection methods at both time-periods (mean fold-changes relative to SHAM (MFC) were 333-fold and 483-fold at 1 week and 330-fold and 558-fold at 6 weeks for GRIND and CLIP treatments respectively). CALCB expression was downregulated at both time-points for CLIP (MFC=0.29- and 0.13-fold at week 1 and 6 respectively (p<0.001)), but only at week 1 for GRIND (MFC=0.55-fold (p<0.05)). These findings indicate that tooth resection by both clipping and grinding induces a prolonged localised inflammatory state lasting up to 6 weeks after injury as evidenced by increased mRNA expression of the pro-inflammatory cytokine CXCL8 within the injured tooth pulp. The two resection methods differentially reduced CALCB expression in the injured tooth pulp suggesting both methods may have implications for dental pain in piglets. Tooth clipping had a greater impact on CALCB mRNA expression which was still present at 6 weeks post-injury. CALCB downregulation may reflect differences in neurogenic responses by dental pulp cells to different severities of tooth damage, although this has yet to be confirmed or otherwise in this study. In summary these findings suggest that tooth clipping and grinding in piglets has differential and detrimental effects on tooth integrity which have implications for sustained inflammatory tooth pain in piglets up to 6 weeks after tooth resection injury.